Electrical News

Generation, Transmission and Application of Electricity

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EDITOR'S ANNOUNCEMENT.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

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NEW YEAR'S GREETINGS.

The Electrical News once more extends to its friends and patrons hearty wishes for a prosperous and happy New Year. Our hopes of a year ago have been fully realized. The year 1910 in Canada has been one of continued prosperity and unexampled activity and progress in electrical matters. Canada is rapidly establishing her right to a position, if she has not already done so, in the very forefront of the countries of the world in electrical matters, both technical and industrial.

The approach of the new year shows undoubted evidence of continued and ever-increasing activity. Our wish is that you may all reap your fair share of benefits from Canada's future electrical development.

Young vs. Gravenhurst

The legal case of Young vs. Gravenhurst, in which judgment was recently rendered by Mr. Justice Riddell, opens up, once more, a question of vital importance to the citizens of every municipality where electrically controlled utilities operate, and more especially if the concluding paragraph of the judgment is borne out by the facts.

In concluding his judgment, Justice Riddell took occasion to add: "The very alarming state of the plant, etc., of the defendants is said to be not at all unusual—if that be the case there are thousands in daily peril of death or maiming—a state of affairs which calls loudly for legislative interference. The most ordinary regard for human life and limb seems to necessitate some measure of governmental supervision and the most strict and searching of official inspection."

Our readers are probably sufficiently aware of the main facts of the case: John Young, a lad 11 years old, suffered a severe shock, while lying in bed, by touching an incandescent lamp suspended over his head. His injuries were so severe that his left hand had to be amputated, and his skull was literally burned through to the brain in two places.

The judgment finds that by some means the lamp had become connected with the higher voltage (2,200 volts) of the town's distributing system. It appeared that in some manner a guy wire, loosened from its proper position and suspended by a broken insulator was the cause of the trouble, but this fact was not able to be clearly proven. It was held by the defendants that 110 volts, with sufficient amperage, might inflict the lad's wounds. The plaintiff's experts, on the other hand, performed certain experiments to prove that a higher voltage, only, could have had such disastrous results. Justice Riddell chose the evidence of the latter and awarded the mother damages to the amount of $2,250, and to the son $7,000.

In view of the apparently inconclusive evidence presented on many points it is understood the case will be appealed, and we refrain from comment on the apparent condition of affairs in Gravenhurst until such time as all possible evidence has been procured and final judgment delivered. The question raised, however, is far from being a local one. The judgment hints that similar conditions exist in many other plants—this may or may not be correct—and a measure of governmental supervision is suggested. We understand that the Provincial Government has had its attention officially drawn to the matter and that the question has been handed over to the Hydro-Electric Commission for consideration.

It comes as a surprise to most, that our Governments have not, during all the past years of development in electrical matters, taken any steps to safeguard the public by competent inspection and supervision. The Dominion Act does, indeed, provide for the appointment of a chief electrical engineer, "who shall have the general supervision and direction of the work of electric inspection throughout Canada," but we are informed by Mr. Ormond Higman, the present appointee of that office, that the scope of the Act is very narrow. The following extract from Mr. Higman's letter makes this abundantly clear:

"The inspection of wiring in municipalities does not come within the scope of the Electricity Inspection Act. It is true that Section 11 of the Act states that the chief electrical engineer shall have the general supervision and direction of the work of electric inspection throughout Canada but this is understood to mean the work covered by this particular statute which deals with the subject almost entirely from the weights and measures point of view, that is, the accuracy of the appliances through which electricity is bought and sold."

The Provincial Parliament also lightly touches the question of inspection in its recent Act respecting the Hydro-Electric Power Commission of Ontario. Clause 4 of this Act reads as follows: The Commission may from time to time make orders

and regulations as to the construction, operation, protection, and inspection of the works, plant, machinery, appliances and equipment for transmission and distribution of electrical power by municipal corporations, and railway, power, or transmission companies.

This, however, has only been taken as applying to such equipment or the inspection thereof as may be brought to the attention of the Commission by any given municipality, and, as a result, no organized inspection of either old or new electric plants has been attempted.

We took occasion very recently in an editorial in connection with a fatal accident, due to carelessness in line construction in a small town, to call the attention of the Government to the crying necessity for better Government inspection. What we said then we repeat now, that a Government is guilty of breaking the sixth commandment which fails to ensure, so far as legislation can do it, a fair measure of safety to citizens who use or are brought in contact with electrical appliances or energy in any form. The problem does not seem to be a difficult one beyond the speedy appointment of a sufficient staff of competent engineers to make the inspections, giving them sufficient authority to order any necessary changes.

Toronto Railway P. A. Y. E.

The Toronto Railway Company early in December established the P.A.Y.E. plan of collecting fares throughout the entire system and at the same time withdrew the privilege, so long enjoyed that it almost seemed a right, of smoking on the rear platforms.

The citizens of Toronto, led by the municipal authorities, raised serious objections to these two by-laws. Public sentiment in favor of the smoking by-law was so marked from the very beginning, however, that agitation for its repeal made no headway and the matter was speedily dropped. But the new system of collecting fares came in for more opposition and to meet the apparent wishes of the citizens the Railway Company has withdrawn the plan for a month on streets where the smaller coaches are used until the busiest season shall be passed and until all the coaches can be properly equipped with fare boxes and larger rear vestibules.

On streets where the larger coaches are in use with large stationary fare boxes and big rear vestibules the P.A.Y.E. system has already added much to the comfort of Toronto's street railway users, and its failure to give general satisfaction cannot be charged against this plan of collecting fares, which is being used with entire satisfaction in other cities and is generally recognized as the most approved practice in modern railway operation.

The partial failure of the system, or, perhaps it would be better to call it the lack of immediate success of the system in Toronto, is due to a number of causes: The authorities put deliberate obstacles in the way where they might have assisted; conductors were commiserated or derided until they, being human, began to feel they really had a grievance against the company—this eventually made them rather anxious to see the company beaten; the time of the year chosen for the change turned out to be inopportune, as the present December is a record breaker for low temperatures; many of the Toronto coaches having small rear vestibules, do not lend themselves to the operation of this system.

The daily press has been unfair. After the first appeal to the Railway Board the one member who inclined toward the city's side was termed the only "sane" member of the board. After the second appeal when all three members were unanimously in favor of the company, the Board was designated a "bunch" and threats were freely expressed of what Toronto would do to the Whitney Government if they were not removed from office. Further than this, they will see no good in any thing the street railway may do, ascribing ulterior motives, always deliberately neglecting the fact that the municipal authorities are quite as likely to be insincere, having relatively quite as much personal interest at stake. Finally, open approval was expressed of the disgraceful scenes in connection with the Massey Hall meeting, the aftermath of which pretty clearly indicated the class of citizens which made up a fair part of the audience.

After all, it seems a pity that so much good powder and shot had been wasted over such a small matter. What is actually lacking in the Toronto system is more mileage and many more cars. Now an agreement has been reached we shall probably get some new lines. Also new coaches should be ready as soon as there are lines to run them on—they would be almost useless at present.

If the new mayor will busy himself at once, and constantly, in hastening the arrival of these two improvements he will be doing something to really gratify the undemonstrative part of the electors and should supply enough fireworks to satisfy even the window smashers.

Poor Business, This!

A little incident was brought to our notice a few days ago which indicates a "leak" in the treasury of at least one central station manager. Perhaps there are others. We relate the incident for the sake of any it may concern.

About a year ago last October, a party in the field for a certain current-consuming device requested his central station owner to get him information and prices on this article, as he wished to make a purchase.

After being requested several times, the central station man eventually wrote the manufacturer, who replied by return mail, giving full information and prices.

Also, after forwarding this information, the usual follow-up was used. Several follow-up letters were written but no reply was obtainable.

A few days ago the merchant who had requested the central station owner to get him the information came to Toronto and when in conversation with a Toronto merchant about the article in question, was referred, as it afterwards turned out, to the very manufacturer who sent the information out to the central station man.

The result was that the manufacturer and the merchant got together and the article desired was purchased.

During the conversation it transpired that the central station manager had neglected to even pass on the information to the would-be purchaser, obtained from the manufacturer.

Which all goes to show how far from "wide awake" this central station manager was.

Are there any others like him?

Ontario Railway Operated by Edison Storage Batteries

The Edison storage battery, from which so much is hoped by its inventor, is now being handled from a Toronto office and a Canadian company will probably be formed with Mr. John W. Moyes, consulting engineer, as president. No active attempt is yet being made to place the battery in the Canadian market as the supply is, as yet, limited, but it is understood the beginning of the new year will see a much greater activity in the sales department of the company. Mr. Moyes, however, is showing his faith in the Edison battery by having his rolling stock on the Ontario West Shore Road equipped with them. This road is practically completed between Goderich and Kincardine, with the exception of a couple of bridges, and for some time past steam locomotives have operated a freight business over part of the line. It is understood the storage battery coaches will be put on the road early in the spring, that already one of the coaches is being tried out on one of the Edison lines, and

that it has been proven that a 40 passenger coach will make a 70 to 90 mile run on average grades without a renewal charge. A number of automobiles and trucks in Toronto are also being operated by these batteries and are said to be giving all the satisfaction that was claimed for them.

Special Convention Canadian Electrical Association

The committee appointed at the last convention of the Canadian Electrical Association to consider the proposal to affiliate with the National Electric Light Association have since submitted a report to the managing committee recommending affiliation. This report was approved by a majority of the managing committee at a meeting held in Toronto on November 12th, when it was decided to call a special general meeting of the association to consider the question and forthwith amend the constitution should the report be adopted. A special meeting for that purpose will be held in the committee room of the Prince George Hotel, corner King and York streets, Toronto, on Friday, January 20th next. Two sessions will be held, 10 o'clock in the morning, and 2.30 in the afternoon.

This will be an interesting meeting and it is expected that there will be a large attendance and very general and thorough discussion. Under the constitution, only members of the executive section, i.e., representatives of private light and power companies, are entitled to vote on a question of this kind, which, of course, contemplates amendments to the constitution. But whether a member of the executive section or not, every member is requested to be present and contribute to the discussion.

The committee on affiliation point out that the National Electric Light Association has undertaken the work of organizing the electric light and power industry all over the continent for greater strength and influence, has already a large membership in Canada, and if affiliation is not adopted, will inaugurate a very active campaign for new members in Canada and that it is better to work with them than compete with them.

Against affiliation, it is argued that we should maintain a strictly Canadian Association, free from any connection with any other organization in another country, founded on our own constitution, and with provision for provincial sections and committees.

The N. E. L. A. Constitution.

By affiliation the Canadian Electrical Association would become a geographic section of the National Electric Light Association, and as such one-half the fees would be returned to the Canadian Association with the exception of the receipt from Class A members based on their gross incomes or from Class D members based on their enrollment at conventions.

The classification of membership and fees under the N.E.L.A. constitution would be as follows:

Class A members shall be private corporations or individuals engaged in the business of producing and supplying electricity for light, heat or power for commercial or public use. They shall be entitled, through their regularly accredited delegates, to attend all meetings of the Association, to vote and to hold office. Annual dues, in cities and towns of less than 5,000 population, $10; in cities and towns of 5,000 and less than 10,000, $15; in cities and towns of 10,000 and less than 25,000, $20; in cities and towns of 25,000 or more, $25 plus 1/100 of one per cent. of the gross receipts from electric sales of the company for the preceding calendar year, providing, however, the maximum amount of dues from any one Class A member shall not exceed $1,250.

Class B members shall be officers or employees of member companies elected and continued only from year to year with the written consent of the member company with which they are connected. They shall have all the privileges of Class A members except the right to vote and to attend the executive sessions of the Association, but shall be allowed to attend such executive sessions upon obtaining the written consent of the member company vouching for their membership. Annual dues, $5, including membership in any one section other than a company section, and $2.50 additional for membership in each additional section.

Class C members shall be instructors, teachers and practitioners of engineering and related sciences and of other professions who are in sympathy with and approve of the objects of this Association. They may become members only upon the annual invitation of the executive committee. They shall have all the privileges of Class A members except the right to vote, to hold elective office and to attend the executive sessions. Annual dues, $5.

Class D members shall be electricians, electrical or mechanical engineers, manufacturers and publishers—corporations or individuals—who are directly or indirectly interested in advancing the use of electricity. They shall have all the privileges of Class A members except the right to vote, to hold office and to attend the executive sessions. Annual dues, $20. Each Class D member, however, shall pay to the treasurer of the of the Association $5 for each representative or guest enrolled under its name at the annual convention.

Class E members shall be officers or employees of associate member companies elected and continued from year to year with the written consent of the company with which they are connected. They shall have the same privileges as Class D members. The annual dues shall be $5, including membership in any one section other than a company section, and $2.50 additional for membership in each additional section.

Honorary members shall be elected upon unanimous recommendation of the executive committee and approved by a two-thirds vote of the Association. They have all the privileges of Class A members except the right to vote, to hold elective office and to attend the executive sessions.

Annual Convention in Winnipeg.

The managing committee has decided to hold the next annual convention in Winnipeg. This is a progressive step. The experience of the American Street Railway Association and other organizations in the United States is evidence of the stimulus and increased growth resulting from a departure of this kind. The Winnipeg convention can be made a big success. It will be popular with the electrical men of western Canada, many of whom have never had the opportunity of attending the conventions of the Canadian Electrical Association.. The question of the exact date, the appointment of a strong Eastern Convention Committee to act in conjunction with a Winnipeg committee, and railway and other arrangements, will be discussed at the proposed January meeting.

Verandah Not Approved

Answering Mr. H. Webster's suggestion in our December issue regarding the placing of meters, Mr. L. C. Buston, of the Nipissing Power Company, writes:

Mr. Webster's letter in last month's "Electrical News" is certainly an interesting one. I have seen but little correspondence on "Consumers" in your valuable paper, and, after all, it is they who keep us engineers employed. In my humble opinion correspondence on the care of handling consumers, is just as useful and instructive as care in handling the power plant, for what is one without the other?

I can hardly agree with Mr. Webster that the best position for fixing the meter is inside the verandah roof, as many verandahs have creepers, etc., covering the roof, and insects seem to me to have a great liking for the inside of a meter. During my experience in handling some 8,000 consumers, I have seen many meters brought in from consumers' premises, and when the cover was lifted, swarms of insects, beetles, etc., would

creep out. I think the reason they are attracted to the meter is owing to the slightly higher temperature inside.

I should like to know whether Mr. Webster has found his meter register with the same accuracy under the verandah roof in the real cold weather, as in the test room with the higher temperature.

A Cobalt Power Merger

The New Liskeard electric light plant and franchise; the Haileybury steam plant, electric system and franchise, and the Cobalt plant and franchise have recently been acquired by the Cobalt Power Company. The generating plant of the Cobalt Power Company is at Hound Chutes, on the Montreal river, some seven miles from Cobalt. At this point a head of 33 feet will develop about 6,000 horse-power, of which barely one-half is being developed. The present market for power is chiefly in Cobalt town and the immediate vicinity, but it is now proposed to extend the transmission system to Haileybury and New Liskeard to supply the power and light needs of these towns. It is understood that the Wabi water plant will be closed down for the present. Mr. David Fasken, Toronto, represented the Cobalt Power Company in the purchasing negotiations.

Many Electricity Stations in Germany Municipally Operated

The preliminary results of the Government inquiry relative to the number and condition of electrical generating stations in Bavaria show that 1,620 are owned by private individuals, 374 belong to limited liability companies, while about 500 are controlled by the Government, by municipalities, and by co-operative societies. The output of all these stations, including also the installations used only for private purposes, amounts to 275,472 kilowatts. About 47 per cent. of the plant is driven by steam, 30 per cent. is worked by water power and steam, and 8 per cent. is operated by water power only.

Municipal Operations in Edmonton

The city of Edmonton owns and operates the light and power system, the waterworks system, the street railway system and the telephone system .

The water department for the past year showed a deficit of $9,491 as compared with the larger deficit of $24,607 in the previous year. The street railway also shows a loss of $29,269 as compared with $9,484 in 1909. The light and power department, however, shows a very marked gain, having converted a deficit of $20,289 in 1909 into a surplus of $10,948 in 1910. The telephone department realized a surplus of $9,086 as compared with $6,663 the year before.

The larger deficit in street railway operations is accounted for in increased expenditures necessitated by renewals to track and equipment, which alone cost $12,000. It is also pointed out that fares are lower here than in other cities where conditions are similar; also that certain of the lines serve sparsely settled districts and, in consequence, operate at a loss. Sunday operation, too, has added to the deficit.

Against the deficit, however, must be placed a much more comfortable and rapid service, from twelve to fifteen cars being now operated, where a year ago there were only six.

Mayor Lee has expressed the opinion that it will take two or three years to put this department on a paying basis. It is pointed out that in future the cost of maintenance will be greatly reduced, in that the best rolling stock procurable is being purchased and the extensions being laid down are being constructed so thoroughly that the repair bill will be a small item during the year. It is further pointed out that there are but few cities in the world which have systems laid out similar to Edmonton that ever pay. Many sections are served by stub lines, which it is the intention to extend into loops in the near future.

Proposed British Imperial Wireless Line

It is proposed to construct wireless stations to connect the whole British Empire. The wireless stations necessary would be only 20 in all. They would cost $5,000,000 to build and about $1,000,000 annually to operate. Stations would be required at Montreal, Glace Bay, and Vancouver, Canada; Hongkong; Singapore; Perth, Adelaide, and Sydney, Australia; Wellington, New Zealand; Gibraltar; Malta; Alexandria, Egypt; Aden; Bombay; Colombo; Mombasa, Durban, Cape Town, Bathurst, Sierra Leone, and St. Helena, Africa. The connections required would be: (1) Montreal, Canada, to Sydney, Australia, as follows: Montreal to Glace Bay, also to Vancouver, Hongkong, Singapore, Perth, Adelaide, and Sydney. (2) England to Wellington, as follows: England to Gibraltar, thence to Malta, Alexandria, Aden, Bombay, Colombo, Singapore, Perth, Adelaide, Sydney, and Wellington. (3) England to China, by route 2 to Singapore, thence to Hongkong. (4) England to Africa, as follows: England to Gibraltar, thence to Aden, Mombasa, Durban, and Cape Town; or, England to Bathurst, thence to Sierra Leone, St. Helena, and Cape Town.

New British Aluminum Alloy

A Birmingham firm has discovered and patented a new alloy of aluminum, which is called clarus, and for which many claims are made. It is claimed that this alloy is at least 60 per cent. stronger than ordinary aluminum and that its weight is one-third that of brass of an equivalent volume; that it will take a very high polish, equal to that which can be obtained with silver; that atmospheric surroundings do not cause it to tarnish; that castings are not brittle, but can be bent cold; that it is suitable for castings of any size, and that in all circumstances such castings have been found to be sound and free from blowholes and other defects. It is claimed that the new alloy is excellently suited for automobiles and for electric railroad, railroad car, and aeroplane fittings. The manufacturers state that it has been made into sheets, drawn into wire and into tubes and rods; that they have spun it and stamped it, and that they have made handpole brackets for the underground electric railways of London, for railway carriage fittings, for carriage furnishings, street car fittings, and automobile and motor bus fittings.

It is very little more costly than pure aluminum. Inasmuch as in aluminum alloys much spelter has been used to reduce the cost, the cost of production of this alloy would be greater probably than that of alloys with heavy percentages of spelter, etc. The alloy clarus is made from aluminum of 98 to 99 per cent. purity.

Wireless Telegraphy on Ships

Mr. Lewis has again introduced his bill at Ottawa respecting wireless telegraphy on ships. In introducing the bill Mr. Lewis said in part:

"The bill is modelled almost exactly on the one I introduced last year and which was sent to a committee. But the committee, while in favor of the principle of the bill, thought it was premature. The circumstances now, however, are more imperative and demand that we should have a law of this kind. The United States Government and the Canadian Government have instituted wireless telegraph stations all over the lakes and on the eastern and western seaboards. It is possible that this bill, which is modelled on the English measure, may not suit the circumstances and exigencies in this country, but I ask that it be referred to a committee of marine men who will draft a measure acceptable to all parties. I have in my hand an account of a large number of cases within the last twenty years in which this mysterious and invisible agency called from the deep the assistance of men. I refer to the 'Republic,' off the coast of New York; the 'Ohio,' off the coast of Alaska, and also on August 11, 1910, to a ship which was on fire in Lake

Michigan, all which made their predicament known by the wireless. Then there was the rudderless Clyde liner 'Iroquois,' which drifted about helpless until rescued through help summoned by the wireless. Every passenger boat, capable of carrying more than fifty passengers should be equipped with this wonderful agency for the preservation of human life.''

Following is the full text of the Act:

1. Every sea-going and coasting passenger ship over four hundred tons gross tonnage, registered in Canada, and every sea-going and coasting freight ship over twelve hundred tons gross tonnage, registered in Canada, shall be equipped with an apparatus for wireless telegraphy.

2. Every owner of any such ship who neglects to equip it with the said apparatus shall be guilty of an offence, punishable on summary conviction or on indictment, and be liable to a penalty of not less than one hundred dollars and not exceeding one thousand dollars, or to imprisonment for a term not exceeding twelve months, or to both fine and imprisonment.

Arbitration Proceedings in Winnipeg

The arbitrators appointed as a board of conciliation to settle the disputed matters in connection with the Winnipeg Street Railway Company and its four men who were dismissed for drinking while in uniform, have handed out decisions in the form of majority and minority reports.

The majority report is submitted and signed by W. J. Christie, chairman, and Captain William Robinson, acting for the company. The minority report is submitted and signed by Mayor Peltier, of Port Arthur, acting for the men.

The clause on which the decision mainly hangs is as follows: Entering any place where intoxicating liquors are sold as a beverage, while in uniform or while on duty, except in case of necessity.

The majority report sustains the action of the company in dismissing four men for drinking while in uniform, claiming that the clause is clear and admits of only one interpretation.

The minority report submits that the rule violated was not generally enforced and recommends the reinstatement of the men.

It is pointed out further that another clause in the agreement, viz.: Constant frequenting of drinking places is prohibited—may be considered as modifying the former clause and as indicating the company's willingness to allow a certain amount of liberty to the men even when in uniform.

As a result of the decision of the company to be guided by the majority report the employees declared a strike.

An Ounce of Prevention

Mr. James Bennett, chief electrical inspector of the Canadian Fire Underwriters' Association, has issued a bulletin to the retail merchants of Montreal with the object of avoiding danger by fire during the Christmas season. He suggests that merchants should give the association an opportunity to discuss the proper manner in which electrical details should be carried out. Mr. Bennett points out that the disastrous experiences of other cities, resulting from a neglect of such matters proves beyond question that reasonable precaution taken in due time is to be preferred to belated and extreme measures enforced only in time of public panic and when perhaps it is too late to prevent great loss.

City Electrician F. A. Cambridge, of Winnipeg, has also expressed himself forcibly along the same line and says in part:

''The question of defective electrical wiring in connection with holiday displays is seriously engaging the attention of the city electrical department.

''Merchants have been asked to co-operate in the work of establishing safe conditions by submitting to the electrical inspector prepared plans for these exhibitions, so that serious fire hazards involved in their execution may be pointed out and avoided.

''Those who do not have the welfare of the city sufficiently at heart to voluntarily avoid these dangerous practices should be forced to do so by the proper authorities, and public opinion will approve any effort on the part of the electrical inspector which tends to abolish hazardous conditions coming under his jurisdiction, and it is expected the reputable business men will, by both precept and example, actively support this campaign.''

Much Time Saved

The Western Union Telegraph Company has inaugurated a new service, which, if it works out favorably, will probably be adopted by all the transcontinental lines both in the United States and Canada. A merchant in Vancouver dictates a letter to a customer or firm in London. The message is telegraphed across the country to New York at the usual tolls. At New York it is typewritten as received and put in a special stamped letter and deposited on a mail steamer leaving that day. Only an extra five cents for postage is charged for this extra service. Thus a merchant in Vancouver can write a letter at noon and have it catch an outgoing liner at New York sailing three hours after he has written his letter. It should materially facilitate rush orders and aid those with whom time is the great essential.

Victoria Power Rates

The B. C. Electric Company last year promised this city that they would supply power from the Jordan river plant at one-half what it was then costing the city to produce. Extensive investigations have since been proceeding and Mr. M. Hutchinson, the city's electrical superintendent, states that the city is now producing power for about 2 cents per k.w.h., which would mean a 1 cent rate when Jordan river power arrives. Pending a definite decision a temporary rate of 1 1/10 cents per k.w.h. has been agreed upon.

Personals

Mr. W. P. Robinson, representing the American Electric Fuse Company, Muskekon, Mich., has opened an office at 623 Traders Bank building, Toronto.

Mr. George Stoever, Toronto representative of Fensterer & Ruhe, is at present on a trip to Germany and the Continent.

Mr. James Bain, recent assistant engineer at the Beach pumping station, Hamilton, has been appointed chief engineer succeeding Mr. James McFarlane, resigned.

Hon. I. B. Lucas recently addressed the Canadian Club of Berlin on the subject of telephone development. Mr. Lucas advocated Dominion ownership of the trunk lines.

Mr. James W. Crosby, general manager of the Halifax Electric Tramway, is taking a Mediterranean tour for the benefit of his health.

Mr. H. B. Logan, president of Dossert & Company, has also been elected president of the American Oil Storage Company, a New Jersey corporation capitalized at $500,000 which has acquired the patent rights for the manufacture, sale and rentals of Keefe's patent sectional steel flange storage tanks. Mr. Logan is well known in the electrical trade circles through his connection with the sucessful development of Dossert solderless connectors.

Mr. J. C. Kelcey, chief of the sales department of the Kellogg Switchboard & Supply Company, and also well known in the telephone world as the author of those snappy articles appearing each week in Telephony, dealing chiefly with the Bell monopolies, spent a couple of days recently in Toronto. Mr. Kelcey expressed the opinion that independent telephone conditions in Canada are unusually prosperous.

Calgary's Successful Municipal Railway System

For the first eleven months of the year Calgary's street railway nets the city a surplus of $51,763. For the month of November alone the net earnings are $9,686. By the end of the year it is calculated the surplus will be equivalent to a two mill tax rate.

The gross earnings for the month of November amounted to $19,857.01, and the expenditures to $10,170.58. The proportions operating expense to revenue was 51 per cent. The earnings of the railway for the first eleven months amounts to over $190,000. The figures showing revenue and operating expenses for eleven months, and the estimates made at the beginning of the year by Manager Thos. H. McCauley for the twelve months, are as follows. It will be seen that the eleven months' revenue already exceeds the estimate for the year. It is worthy of note that Calgary adheres to the businesslike plan of putting aside 5 per cent. of gross revenue for reserve account.

Revenue.	
Estimated revenue, 12 months	$170,500.00
Actual revenue, 11 months	190,757.88
Operation Expenses.	
Maintenance of way and structures—	
Estimated cost, 12 months	$7,500.00
Actual cost, 11 months	5,486.90
Maintenance of equipment—	
Estimated cost, 12 months	9,100.00
Actual cost, 11 months	11,015.06
Transportation and operating—	
Estimated cost, 12 months	90,400.00
Actual cost, 11 months	75,597.63
General expense—	
Estimated cost, 12 months	8,500.00
Actual cost, 11 months	7,509.36
Totals—	
Estimated operating expenses, 12 months	$115,400.00
Actual operating, 11 months	99,608.95
Estimated profits, 12 months	55,100.00
Actual profits, 11 months	91,148.93
Less fixed charges, 11 months' sinking fund and interest at $2,715.88 per month	29,874.68
	$61,274.25
Less 5 per cent. gross revenue (reserve account)	9,537.89
Net clear profit, to credit of city general account	$51,736.36

Development of La Colle Falls

Through the action of the Prince Albert civic authorities a proposition is to be put before the Dominion Government which may mean that the work of rendering the Saskatchewan river navigable may be started earlier than anticipated. Engineers who have been conducting the Government surveys on the river have stated that one of the most difficult places to render navigable is that portion of the stream known as La Colle Falls. The city of Prince Albert, as has already been announced, has decided to construct a power plant at this falls to provide the city with cheaper power and light than is obtainable at present. The idea of the engineers is that combination work on the part of the city and government at La Colle Falls would save money to the Government in making the river navigable at that point and would also save money for the city in the construction of the power plant. A conference has already taken place between C. H. Mitchell, of the firm of Mitchell & Mitchell, Toronto, who is the city's power engineer, and the Mayor of Prince Albert, and arrangements have been made to approach the Government in the matter. The proposal is said to be that the Government pay one-half the cost of the power dam and two-thirds of the cost of the power canal and that it provide its own locks. This scheme will be pressed at Ottawa by the local authorities. The city has already given notice that it will introduce a bill at the coming session of the Saskatchewan Legislature to have its borrowing powers extended to permit of the financing of the power scheme, which without any deal with the Government will cost the city in the neighborhood of $450,000.

It will be remembered that the La Colle Falls is a low head development, about 28 feet, on the North Saskatchewan river about 25 miles from Prince Albert. The total development is said to be 10,000 h.p., but it is probable not more than 4,000 will be developed immediately. Mr. Mitchell has stated his belief that power can be delivered at the city limits for $20 per horsepower.

Hydro-Electric Power in Midland and Penetang

The town of Midland will probably obtain a supply of power from the Simcoe Railway & Power Company, which is building a 6,000 horse-power hydro-electric development at the Big Chutes on the Severn river, some 27 miles from Midland. It is understood the town was unable to make satisfactory arrangements direct with the company, and has applied to the Ontario Hydro-Electric Commission, asking them to make arrangements with the development company. A transmission line already connects the power house with Midland, and if arrangements are completed it is proposed to extend this line to Penetanguishene. The two towns would require about 1,500 horse-power between them. The conditions of supply and rates to the towns will in all probability be similar to those under which power is purchased from the Ontario Power Company and sold to the cities and towns of southwestern Ontario.

Sidney Electric Power Company

The Sidney Electric Power Company is now constructing a power house near Trenton at Dam No. 2, on the Trent river, about one-half mile north of the G.T.R. track. The generating apparatus being installed consists of four 750 k.w. vertical type units, 60 cycles, 3 phase, 6,600 volts. These with two exciters are being supplied by Messrs. Kilmer, Pullen & Burnham, Canadian agents for the General Electric Company of Sweden. The turbines will be Jens Orten-Boving manufacture.

A transforming station is also being constructed near-by to step up the output of the above power houses, as well as other small power houses in the Trenton vicinity, controlled by the same company. Current will be stepped up to 44,000 volts for transmission along the lines of the Seymour Power & Electric Company to Oshawa, Bowmanville, Cobourg, Brighton, Colborne, Trenton, Belleville, Lehigh Portland Cement mill and other substations along the lake front.

The step-up transforming station will contain, at present, three 3,000 k.v.a., 3 phase water cooled transformers, to be furnished by the Canadian Westinghouse Company. For stepping down the voltage in the various sub-stations above mentioned along the lake front thirteen 750 k.v.a., 3 phase, and other smaller sized transformers have been purchased from the Canadian General Electric Company. Some of the Canadian General Electric transformers have been in operation since early summer; others are being installed at the present time, notably four 750 k.v.a. units for the sub-station of the Lehigh Portland Cement Company, who propose running their mill entirely by electricity from January 1, 1911. Smith, Kerry & Chace are electrical engineers.

Government Telegraph Lines

The report on Government telegraph lines for the year ending March 31st, 1910, submitted by D. H. Keeley, general superintendent, is to hand. The report shows that the total number of miles now operated by the Government, throughout the Dominion, amounts to 7,494, with an added 255 miles of submarine cable. The aerial lines are distributed as follows:

Newfoundland, 14 miles; Nova Scotia, 709½; New Brunswick, 76¼; Quebec, 2,006; Ontario 28½; Northwest Provinces, 1,117; British Columbia, 1,000¼; Yukon, 2,542½. The 255 miles of cables are distributed among Nova Scotia, with 31¾; New Brunswick, with 11; Quebec, with 184¼; Ontario, with 17¼; and British Columbia, with 11 miles.

The latest figures to hand showing the extent of the four telegraph lines operating in the Dominion are given hereunder. The total length of line of the four systems is 33,813 miles.

Name of System.	Length of Lines in Miles.			
	Aerial Pole line.	Under-ground.	Sub-marine.	Total.
Great North Western Telegraph Co.	11,386	......	......	11,386
Canadian Pacific Telegraph	12,004	3	......	12,007
Western Union Telegraph Co.	2,639	32	......	2,671
Government Telegraph Service	7,494	......	255	7,749

The People's Railway Progress

The People's Railway Company have already carried by-laws in eight municipalities amounting to $245,000, and on Jan. 2 they have four to be voted on, amounting in all to $126,000. These four are as follows: Fergus, $20,000; Garafraxa Township, $40,000; Luther Township, $30,000; and Proton Township, $36,000. The present outlook is that these by-laws will all carry. There has also been 1,442 shares of common stock sold, par value $100 per share, making a total of $389,200 stock sold in all. If the four by-laws, which are being voted on in January, are carried, it will make over $515,000 of stock sold.

Construction work on this road was started on the 4th of July last, and although there has not been a very large force of men at work, yet the construction has never been stopped, and the most expensive portion of the work between Berlin and Guelph is now completed. The company are building the road to a high standard of specifications, and in the portion between Berlin and Guelph, will not have anything over one and one-half per cent. grades, and the curves are very easy. By operating with hydro-electric power, the company claims it will be able to make very substantial dividends.

Iron and Steel by Electric Process in Norway

Experiments to produce iron and steel from Norwegian ores by the electric process have been made during the last three or four years, partly by aid from the Government, in response to a petition sent to the Department of Commerce and Industries by the Christiania Polytechnical Society. Private interest has in this manner been awakened, and the industry now promises to become one of considerable importance. The Norwegian iron ore is often so poor that smelting by the old process was found profitless.

The owners of a paper mill at Tinfos, in Notodden, Telemarken, Norway, have for some time been making experiments for the purpose of producing iron by melting iron ore by the use of electricity as the source of heat. The works were completed in February last, and there has already been an output of 250 tons of iron. The ore used has been mined partly at Lango, near Kragero, and partly at Klodeberg, near Arendal. The melting was accomplished by the use of an electric furnace of about 500 horse-power. This is the first iron produced by the new process, and in commemoration of the event there has been cast and sent to the Christiania University an ingot of the metal weighing 60 kilos and provided with an appropriate inscription.

A stock company, styled the Hardanger Electric Iron & Steel Works, is at present being organized. The capital stock is to be $294,800, of which there has already been sold $160,800. There are 4,400 shares of $67 each. The works are to be located at Ullensvang, in Hardanger, on the west coast, and the object is to produce iron and steel from Norwegian ores by a patented electric process of Swedish origin. The company has secured electric energy from the adjoining water power at Tysse, for a period of thirty years, at a cost of $8.04 per horse-power; 4,200 horse-power will be required. The ore to be used is to be bought from mines in other districts on the best obtainable terms. The transportation of the ore will be found expensive, but it is believed that this drawback will be offset by the cheap power and excellent harbor facilities at the place.

British Columbia Electric Railway Technical School

The following interesting letter has been received from one of the students in the above named Technical School. Some such system as here described is in operation in other large operating companies. We have pleasure in printing the letter in full.

Vancouver, November 20th, 1910.

The Editor the Canadian Electrical News:

Dear Sir,—I am sending a few particulars concerning the British Columbia Electric Railway Technical School for you to publish as it may lead to inquiries from electrical concerns who contemplate a move in this direction and at the same time we out here should like to hear from any of your readers who are already doing this work.

A little over four years ago some of the employees of the company started the school with the assistance of Prof. J. G. Lister as lecturer. From that time on the management has been in the hands of the members. After passing through various vicissitudes there are to-day 38 or 40 members attending advanced and elementary classes on electrical engineering. It is not necessary to state here the details of an electrical engineering course as most of your readers will be acquainted with them, but for some time the committee of the school have been trying to devise means whereby the office employees could obtain sufficient information of electrical work as applied to their work in the head office of the company.

A class has now been started, known as the commercial class, and aims at giving general information of the operation of the company's various systems and dealing with matters between the employee and the customer. One night during the week a lecture is given on some subject and the following week it is discussed amongst the men. This enables them to bring up the subject as it applied to their work.

To satisfy the customer it is necessary to understand the fundamental principles of the work, and following are a few of the subjects to be dealt with:

Meters.—What is to be measured; ampere; volt; watt; meaning of term watt hour and kilowatt hour; how to read meters; meter connections.

Lamps.—Candle power as unit for usefulness; filaments of lamps and their intrinsic values as illuminants; ageing of lamps, cause of, hence simple construction of lamps.

Electric Power.—Application; classes of motors; cost to operate.

Electric Heating Devices.—Their efficiencies and economical working.

Electric Fans.—Their construction, uses, and efficiency.

Fuses.—Their use and method of installation.

House Wiring.—General arrangement of wiring and requirements of city by-law.

Transmission and Distribution of Current.—Necessity for accurate records; alternating current; direct current; application.

The company has fitted up a lecture room and places anything from its plant at our disposal.

The management of the school is in the hands of H. E. Grant, president; M. K. Ney, vice-president; J. Priestman, R. Lyon, E. Milner, committee; Arthur P. Brown, secretary-treasurer.

The members pay $1 per month, and the company also offers $1 per member per month to meet expenses.

Niagara Power in Hespeler

The town of Hespeler has contracted with the Hydro-Electric Commission for 300 horse power. It will be supplied from the town of Preston, where one of the main step-down transforming stations is located, the plan of which was described in the November issue of the "Electrical News."

From Preston to Hespeler the current is carried by two 3-phase, No. 2 stranded aluminium cables. The wires are carried on Idaho cedar poles at a pressure of 6,600 watts. Entering the substation the current passes through remote control high tension oil switches to two 100 k.w. transformers, where the 6,600 volts is reduced to 2,200 volts.

Street Lighting.

The lighting of the town of Hespeler is being accomplished by means of a 25 cycle synchronous motor, driving a 60 cycle single phase generator. This arrangement is practically the same as a frequency changer, excepting that the machines are separate. By this system the incandescent lighting will be accomplished by a 60 cycle current, which is generally admitted to give somewhat better satisfaction than a 25 cycle current. The present system of enclosed arc street lighting will be maintained for some little time, but will be removed from the central portion of the town and used only in the outlying districts. It is the intention of the corporation to install series tungsten street lighting throughout the central portion of the town. These will be mounted on brackets on the present pole lines.

Power Supply.

For power purposes the 2,200 volt 25 cycle current will be stepped down to 550 volts, by means of local transformers at each individual manufactory. One of the objects in installing the synchronous motor is to have it serve as a corrector of the power factor on the power line.

The R. Forbes Company, the largest consumer of power at the present time, will take their power from the 6,600 volt lines at a point immediately opposite their factories, and will handle the same through similar station equipment to that being installed at the municipal substation. The Forbes Company are the largest woolen manufacturers in the Dominion, employing in the neighborhood of 700 employees. Their present power requirements call for about 1,300 horse power in steam. They are at the present time installing a number of small sized 25 cycle motors, which will be gradually increased as their present 60 cycle outfit is found to be too small or requires renewing.

Messrs. A. B. Jardine & Company, one of the foremost and up-to-date manufacturers of taps and dies, pipe cutting machinery, tire upsetters, and various other types of small machinery, are equipping their entire plant with 25 cycle induction motors. This company have recently built a large addition to their works, and are bringing their shops into a very up-to-date condition.

Another user of power is the Hespeler Furniture Company, a concern owned locally, and manufacturing a very high grade of bedroom and dining room furniture. They at present employ about 150 men, and are running overtime to keep up with their orders.

Various other industries using the Hydro power are the Canada Machinery Corporation, the Universal Lightning Rod Company, and a number of small concerns.

The switchboard equipment in the station is composed of three panels, one of which is equipped with the receiving instruments, the second of which is for power purposes, and the third panel is used for the control of the synchronous motor. The entire equipment is being supplied by the Canadian General Elctric Company, and the old equipment in the station is being remodelled to conform with the more up-to-daté modern style of the new equipment. The incoming lines and the station equipment are protected by electrolytic lightning arresters, which are considered to be the highest achievement in this class of apparatus.

The town of Hespeler is located on the River Speed, nine miles south of Guelph, five miles north of Galt, and is served by the Grand Trunk and Canadian Pacific Railways, which give the town excellent shipping facilities.

There is at present a very large woolen mill standing idle in the town, but the same is expected to be got into running condition in a short time.

The management of the municipal electric light system is in the hands of a committee of the council appointed each year. The committee for the past year, which, it may be added, is the same as for the four years preceding, is composed of Messrs. L. E. Weaver, chairman, R. J. Lockhart and Henry Karch. To Chairman Weaver especially belongs much of the credit of the successful working out of the hydro-electric scheme in Hespeler.

Calgary Municipal Power Site

The city of Calgary and the Western Canada Power Company both laid claim to a power site near the junction of the Elbow river and Canyon creek. The Dominion Government was called upon to decide which had prior right. The city has received word from the Hon. Frank Oliver, Minister of the Interior, offering an agreement on the following conditions, which the city must accept before January 1, 1911:

1. The city must spend $50,000 on actual power development operations during the year 1911.
2. The city must spend $100,000 on actual power development operations during the year 1912.
3. The city must have a minimum amount of 2,000 effective horse-power developed and ready for use by the 1st of January, 1914.
4. The city must develop the power to a maximum capacity of 5,000 horse-power at any time after 1st January, 1914, should the Minister consider it necessary or advisable in the public interest. If the city is satisfied with this maximum amount, namely, 5,000 horse-power, up to which the Minister may compel the development, it will have no further call or claim upon any additional power which the flowage of the river may be capable of developing at or near the city's power site. If the city desires to increase the amount of this maximum power up to which the Minister may compel it to develop the power, the Department will consider the matter upon the city telegraphing the amount it will consider satisfactory.
5. Development operations by the city to be subject to approval of a consulting engineer and inspector during construction, to be retained and appointed by the Minister at the city's expense.
6. The city to assume all risks in connection with maintenance and operation of all works.
7. The city to indemnify the crown against all actions, claims or demands against it by reason of the construction, erection, maintenance or operation of said works.
8. Schedule of rates proposed to be charged consumers of power to be submitted to the Board of Railway Commissioners of Canada for approval before the issuance by the Department of the license provided by the agreement.

Mr. Kennedy, Jr., of Montreal, is at present preparing a report on the value of this power site, and it is improbable the city will be in a position to give the Government an immediate answer.

Twenty-four Hour Service for Fredericton

Following frequent requests from their customers, the Fredericton, N.B., Gaslight Company has decided to make a trial of twenty-four hour service for three or four months to ascertain what business inducements may offer for the continuance of the service. It is the intention of the company in the meantime to have an active canvas made of all concerns and individuals who might be induced to use electrical power.

The company have decided to introduce the flat rate system of electric lighting, making a contract to light the dwellings at so much per year, payable in monthly instalments in advance. The new scheme is for the smaller class of residences only, as the installation is limited to ten lights; but if a contract is made for a maximum of five lights, for instance, any five of the ten lights of the installation may be kept burning for as long a period of twenty-four hours as the customer desires, a limiter preventing more than five lights burning at once. All wiring and installation done for customers under the flat rate plan will be at cost and the tungsten lamps, which are to be used under the contract, will also be sold at cost. The following rates will obtain under the flat rate contract:

Four	10 watt lamps	$1.25 per month.
Five	20 watt lamps	1.50 per month.
Six	20 watt lamps	1.75 per month.

Steady Progress of Calgary Power Company

The power house and step-up transformer house buildings at Kananaskis Falls, on the Bow river, are nearly completed, and the turbines are being installed. The initial installation consists of two 3,750 h.p. turbines, Jens Orten-Boving manufacture. These will drive two 2,500 k.v.a., 12,000 volt, 60 cycle, horizontal type, Canadian General Electric generators, which were delivered about December 1. The installation of these will be completed early in the new year. The accompanying figure represents the general layout of the Calgary plant. No's 2 and 3 are the units now being placed.

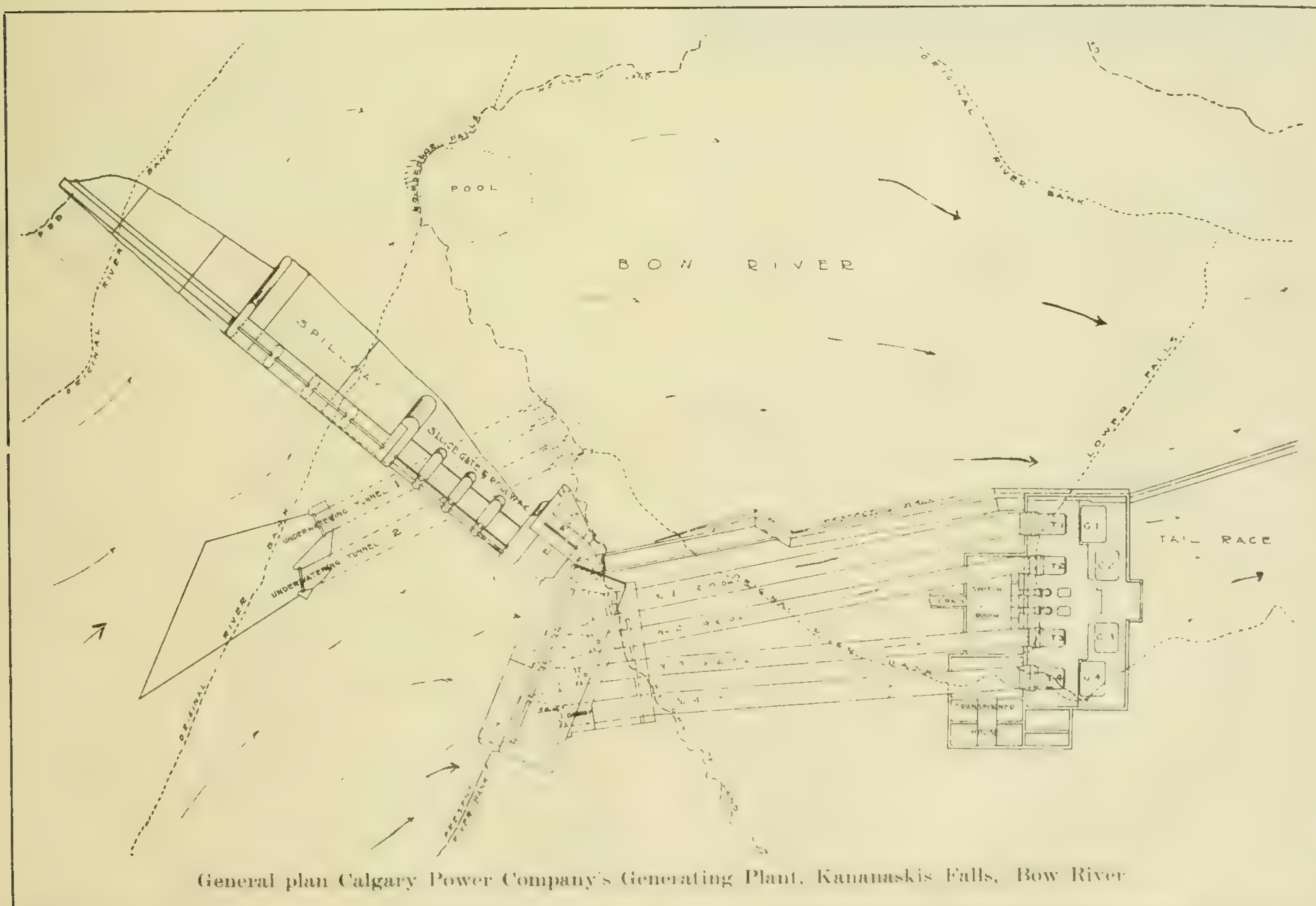
The 55,000 volt, 47 mile, transmission line to Calgary is pretty well completed. The double circuit 12,000 volt, 8 mile line to the Western Canada Cement Company's mill at Exshaw is quite complete, as is also the sub-station at this point, and everything is in readiness for the delivery of 3,000 h.p. to the Cement Company. The transmission wires are carried on wooden poles. Aluminium cable is used throughout and was supplied by the Northern Aluminum Company. The insulators are the pin type, Locke manufacture.

The main terminal station in Calgary is well under way. The station equipment is designed for receiving current at 55,000 volts and stepping it down to 12,000 volts, 24,000 volts and 600 volts. The 600 volt circuit will supply the Alberta Portland Cement Company, who are under contract to use 1,500 h.p. as soon as the system is in operation. The other two circuits will feed the city of Calgary, who are under contract with the Calgary Power Company to take a minimum of 2,000 h.p.

The step-up transforming station at the falls will contain three 3,000 k.v.a. 3 phase units and the Calagry terminal station will contain a total of 8,500 k.v.a. transformer capacity to take care of the city of Calgary and the Cement Company. This apparatus is being supplied by the Canadian Westinghouse, as is also all switching equipment for both stations.

The dam and headworks are making good progress and everything points to the probability that the plant will be in operation early in the spring.

Already the demand for more power has necessitated the placing of an order for a third unit, provision for which was made in the original plan of the power house as shown in the figure. The third turbine will be 6,000 h.p. capacity and is already being built. The Wellman-Seaver-Morgan Company, of Cleveland, Ohio, have the order. The third generator will have a capacity of 4,000 k.v.a., and will be installed by the Canadian General Electric Company. The installation of this third unit is to be completed early in the year. Smith, Kerry & Chace, Toronto, are the consulting engineers.



General plan Calgary Power Company's Generating Plant, Kananaskis Falls, Bow River

New Electric Freight Locomotive

The accompanying illustration represents an electric locomotive for freight service recently built by the Baldwin Locomotive Works for the Galt, Preston & Hespeler Street Railway Company. The mechanical parts of this locomotive were finished and assembled at the Baldwin Locomotive Works, and the machine was then shipped to the Westinghouse Electric & Manufacturing Company, by whom the electrical equipment was made and applied. This locomotive is of double swivelling truck type, with rigid frame and centrally located cab. The trucks are of the equalized pedestal type, with square wrought iron frames and semi-ellipitic springs. Each axle carries a motor, which is wound for 550 volts. The wheels have cast iron centres, with steel tires bolted on. The flanges, journals, and boxes are M.C.B. standard. The wheels were furnished by the Standard Steel Works. The longitudinal frame sills consist of four 10-inch channels, the width over the outside sills being 92 inches. The end bumpers are of cast iron. They have heavy lugs which are riveted to the longitudinal sills, and carry M.C.B. automatic

New Locomotive for Galt, Preston and Hespeler Ry. Co.

couplers. Suitable steps are provided at each end. The frame bolster truss members consist of wrought iron plates, 1¾ by 15 inches, which are strongly braced. The entire frame construction is most substantial.

The cab is of wood, and is roomy and convenient, with four windows in each side. These, with additional windows in the ends, give the operator an unobstructed view in all directions. Suitable hoods at either end of the cab, cover the resistance and other electrical equipment.

This locomotive is fitted with a hand brake on all the wheels, also with the Westinghouse air brake, schedule ET, with motor driven compressor. Sand boxes, with pneumatic sanders, are provided at each end. The equipment also includes a bell and whistle.

The principal dimensions are as follows: Gauge of track, 4 feet, 8½ inches; wheel base of each truck, 7 feet 4 inches; wheel base, total of locomotive, 29 feet; diameter of driving-wheels, outside, 36 inches; diameter of driving-wheels, centres, 31 inches; journals, 5 inches x 9 inches; width, 9 feet; height to top of cab, 12 feet; length, 36 feet; weight, 100,000 pounds.

Orangeville Makes Light and Power Agreement

A new street lighting agreement has been signed by the Town of Orangeville and the Dufferin Light & Power Company. The contract runs for a period of five years, dating from December 2nd, 1910. The town agrees to pay $1,560 a year for the street lighting, the streets to be illuminated by 109 tungsten lamps of the following candle power: [illegible] of 100 c. p., 64 of 80 c. p., and 33 of 50 c. p. In addition the contract calls for 25 lights of at least 16 c. p. each for the Town Hall, 7 lights of at least 16 c. p. each for the Band Stand on Alexandra Park, and all the lights required to illuminate the Public Library building, inside and outside, including the Council Chamber. The company agrees to supply additional tungsten lamps for street lighting, including bracket, wire and other necessary equipment, for $15.60 a year, taking an 80 candle power lamp as the standard. All street lamps are to be lighted continuously from sunset until sunrise every night in the year. The lamps are to be placed from 16 to 20 feet above the ground, mounted on goose neck brackets or suspended in the centre of the street by a wire cable, and must have metal reflectors of the radial type not less than 18 inches in diameter. The company undertakes to change the location of any lights which the corporation requires to be moved at the actual cost of making the change. Provision is made for an abatement computed on the basis of $15.60 per 80 c. p. lamp for all lights not lighted or in operation, no matter what the cause may be.

The rates to private customers are—9 cents per k.w.h., to private houses and 10 cents per k.w.h. to business places, all renewals free. The contract also binds the company to furnish not less than 100 horse-power for manufacturing purposes between the hours of 7 a.m. and 6 p.m. each day in the year except Sundays. The prices being for constant load, 10 hours per day, 300 days a year, for one k.w. and up to five k.w., 2 cents per k.w.h.; for five k.w. and up to ten k.w. 1¾ cents per k.w.h.; ten k.w. and up to twenty-five k.w. 1½ cents per k.w.h.; twenty-five k.w. and up to forty k.w. 1¼ cents per k.w.h.; for forty k.w. or more, 1 cent per k.w.h. Rates for intermittent loads are to be subject to special agreement.

In the event of a breakdown the company is released from its obligation to light the streets for a period of ten days and liable to a penalty of $25 a day thereafter up to thirty days, when either of the parties shall be at liberty to cancel the contract.

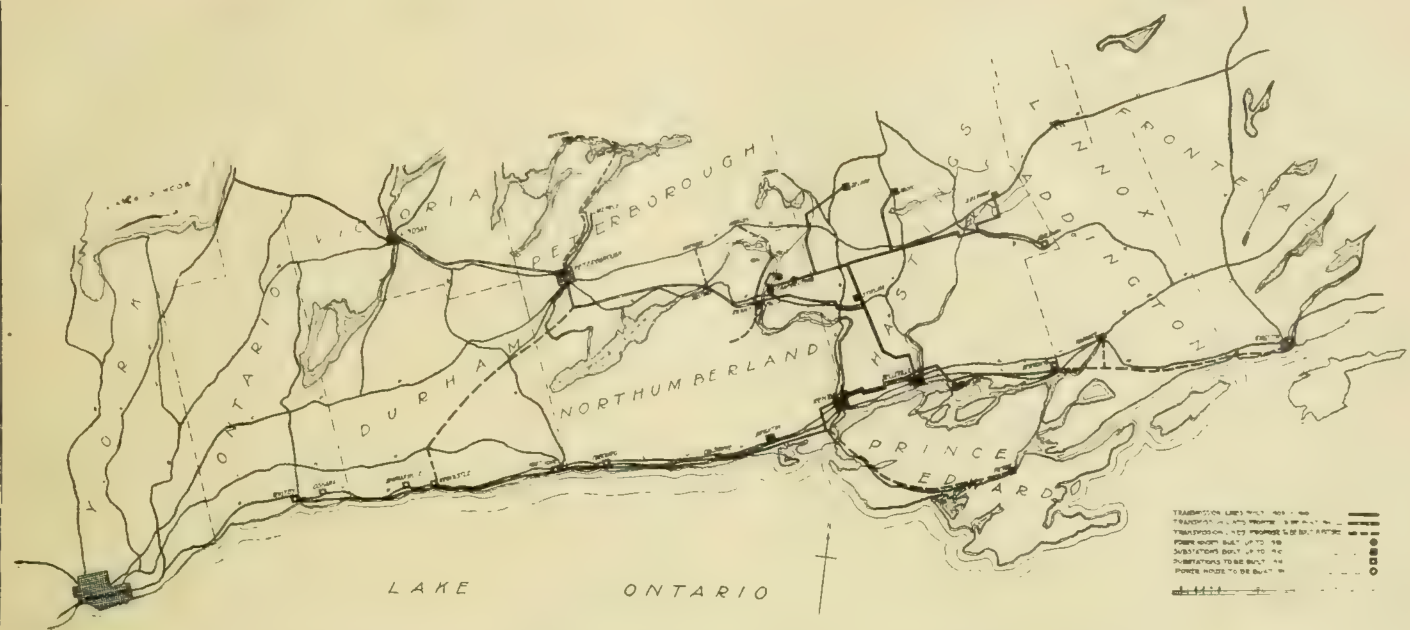
The Electric Power Company, Limited

A system which almost rivals in magnitude that of the Ontario Hydro-Electric Power Commission in southwestern Ontario and which is even more extended than the latter inasmuch as not only the generation and distribution are both controlled by the same company but also the operation of practically all the electric plants of any considerable size within an area measuring some 100 miles long by 50 miles wide, has recently been organized under the name of the Electric Power Company, Limited.

The area served by this company lies between Toronto, on the west, Kingston on the east, Lake Ontario on the south, extending as far north practically as there is need of electric service. The new organization is in the form of a holding company controlling at the present moment the following companies, which until recently have for the most part operated separately:

The Seymour Power & Electric Company, Limited.
The Peterborough Light & Power Company, Limited.
The Peterborough Radial Railway Company.
The Auburn Power Company of Peterborough, Limited.
The Trenton Electric & Water Company, Limited.
The Sidney Electric Power Company, Limited.
The Nipissing Power Company, Limited.
Oshawa Electric Light Company, Limited.
The City Gas Company of Oshawa, Limited.
Cobourg Utilities Corporation, Limited.
Northumberland Durham Power Company, Limited.
Central Ontario Power Company, Limited.

The Electric Power Company derives its energy chiefly at the present time from the plant of the Seymour Power & Electric Company at Campbellford, but also operates a number of small generating plants; also controls and will develop as speedily as possible a number of powers along the route of the Trent Valley canal from Burleigh Falls to Trenton. These water powers



Map Showing Area to be Served by the Electric Power Company, Limited

on the Trent and Otonabee rivers lie in three groups located as follows:

(1) Between Buckhorn lake and Peterborough, a distance of 20 miles.

(2) Between Healy Falls and Bradley bay, a distance of 10 miles.

(3) Between Frankford and the Bay of Quinte, a distance of 6 miles.

The Electric Power Company having large holdings of water rights in each of these three groups, will develop the various powers as warranted by the power market. Location of various water powers in the district, together with present and proposed power houses, substations and transmission lines, is shown on accompanying map.

Hydro-electric power is actually being delivered from five points to the extent of about 10,000 h.p., and this is being distributed over about 130 miles of 44,000 volt transmission lines to seven different substations. Two other power houses having a combined capacity of 75,000 h.p., are now under construction, and in the course of six months the length of transmission lines and the number of substations will be more than doubled by the completion of works now under construction. The ultimate development will reach in the neighborhood of 100,000 h.p. The district to be served will reach from Oshawa to Kingston and will cover an area of approximately 5,000 square miles. The present population of this area is approximately 250,000, and contains such cities and towns as Peterborough, Kingston, Belleville, Oshawa, Lindsay, Cobourg, Port Hope, Bowmanville, Trenton, Campbellford, Napanee, Deseronto, Madoc and Picton. Besides the general distribution of light and power in the various towns and cities in this district the Electric Power Company have secured many private customers who take large amounts of power. Among these are the Canada Cement Company, who will drive their entire mills near Belleville by electric power on and after January 1st, 1911, from that date taking power from the Electric Power Company, and the Northumberland Pulp Company, who have recently completed a mill at Campbellford, where about 2,000 h.p. will be utilized.

Generally speaking, the rates vary from $15 to $25 per h.p. for 24 hour power, according to nature of business carried on by the various power users and their distance from the power plants.

Substations are now being constructed at Oshawa, Port Hope, Cobourg, Bowmanville, Brighton, Colborne and other points in order to furnish the entire light and power service in these various towns and supersede the old steam and water driven plants now in operation at these places. Substations for similar purposes are already in operation at Belleville, Trenton, Stirling and Madoc.

The president of the Electric Power Company is Mr. J. G. G. Kerry; secretary, Mr. A. B. Colville. The head office of the company is in Toronto; the general manager's and superintendent's offices in Belleville. Smith, Kerry & Chace, Toronto, are the designing, constructing and operating engineers.

Activity in Ottawa

The Ottawa Car Co. has installed a new 250 h.p. 2-phase, 2200-volt motor in their factory, to which they are making considerable additions. This company is constructing eighteen new cars of the pay-as-you-enter type for the Ottawa Electric Company. This is evident proof that the "pay-as-you-enter" system has "caught on" in Ottawa. These cars are the last word in up-to-dateness as regards comfort, sanitation and ease of loading or emptying. They have specious enclosed rear vestibules, centre aisles, two rows of rattan or cane-covered seats facing forward, push-buttons, electric heaters for each seat, and compressed air door control. Entrance is by the rear, and exit by the front vestibule.

The Ottawa Municipal Electric Department has completed a six-duct conduit for carrying their trunk lines undergound from power house to distributing station. One six-foot oval-shaped manhole is at each street intersection. The power will be supplied at 10,000 volts.

The city of Ottawa proposes to light Sparks street with ornamental iron poles about 75 feet apart, 5 Tungsten lamps to a pole. It is proposed to have each lamp 80 c.p. The lighting is being done under the Municipal Act, sub-section 2, section 686, as a local improvement. Out of the general fund the city is making the same allowance as that formerly paid for the old street lighting arcs in the proposed new lighting area. Without this allowance the frontage tax charged to the property owners would be 6c. per foot front per month. Deducting this allowance the property owners will pay 5c. per foot front per month.

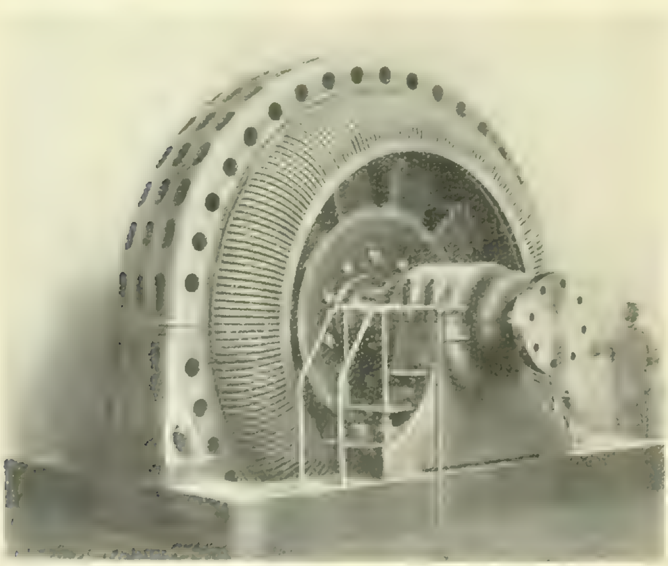
Hydraulic power to the amount of 805,675 horse power is now being continuously developed in Italy.

Fort William a Progressive City

The years of 1909 and 1910 in Fort William have been marked by tremendous changes. The present mayor, L. L. Peltier, has been greatly responsible for the steady progress which has marked the past two seasons, such as block paved streets, first class street railway construction, improvement to the sewage system, good roads leading to the farming community surrounding the city, rural telephone systems and other improvements almost too numerous to mention. Among the latest improvements which he has authorized is tungsten street lighting in the business districts, changing from 6.6 ampere series arc, a block apart, to ornamental 3-light standards 50 feet apart, on both sides of the street. On Victoria avenue the wooden trolley poles are being replaced by combination steel and iron poles with an ornamental casing having 4 lights 12 feet high. These poles are placed about 98 feet apart on both sides of the road. The 3-light standards will be equipped with 3-100 watt tungsten lamps in multiple, while the four light will have 4-100 watt lamps in series with the arc circuits. Already the white way has been started. Around the city hall 8 Jandus lamp standards have been erected, each having 3-100 watt tungstens wired in multiple. This is a great improvement and the people are enthusiastic over the adoption of this new type of street lighting. The change from arcs to the tungstens was first suggested by H. T. Breay, of the firm of Culley & Breay, late of Hamilton, Ont. Mr. Breay's suggestions were taken up by the mayor and council after consultation with Mr. Farquharson, the manager of Public Utilities, who, in turn, recommended it heartily. The actual work is being rushed under the supervision of Mr. Farquharson, the material being supplied by Culley & Breay. At present there are 52 standards purchased to be erected this year, which is only a start on a scheme which Fort William believes will stamp it as one of the most progressive cities in the Dominion.

Large Water Wheel Alternators

The Cliff Electrical Distributing Company of Niagara Falls, which takes power off the turbines of the Niagara Hydraulic Power Manufacturing Company, have just placed an order with Allis-Chalmers Company for another 6500 k.w. 12,000 volt,



The Sixth 6,500 K.W., A.C.B. Generator being installed by the Cliff Company.

three phase [illegible] alternator (see figure). This makes the sixth of these large machines to be installed in the new power house of this company.

These alternators have been of particular interest to the engineering profession because of the unusual and peculiar features of their design and construction made necessary by the conditions of operation. On account of the possibility, which is often present in hydraulic turbine installations, of the turbine running at excessive speed, it was necessary to construct the alternators so that they would be safe under runaway conditions. The normal speed of these machines is 300 r.p.m., but they are designed with an over speed safety factor of 75 per cent., which enables them to run safely at 525 r.p.m., or about five times as great as that of machines of the same capacity when driven by steam engines. The value of these precautions and the success which attended the machines was recently very forcibly illustrated. During adjustments to one of the turbine gates an accident happened which threw the governor out of operation and allowed the unit to run away. Although the maximum possible speed was attained, of 525 r.p.m., neither the generator or the turbine suffered accident.

The Cliff Company's installation may be said to be the newest of all the large hydro-electric plants at Niagara Falls. The generators are horizontal shaft type, being installed with the turbines at the base of the cliff in a similar manner to the Ontario Power Company's generators. Unusual precautions have been taken to prevent flooding of the generators in case of accident to the penstocks, in that the power house is built in two entirely separate compartments with a stout cement wall between, the only openings that could not be closed quite water tight in case of accident being those through which the half-dozen shafts pass which connect the turbines with the generator.

On Conducting the Sales Department of an Electric Light Co.

By Eugene Creed

Years ago the Dutch sent an Englishman, Henry Hudson, to the new world for the sole purpose of opening up channels of trade. For centuries before that time men were seeking markets for their goods. Marco Polo went to China and brought back samples of the wealth of the Orient, and opened up a volume of trade with the Eastern people, that is even now in its infancy. Spain and Portugal sent their navigators to find shorter trade routes to the Indies, and so on through the years have we sent out travelers to find new markets for our products. Whether we sell boots, clothing, diamonds, furniture, locomotives, pumps, dynamos, or electric current, we must, if we would be successful, send our representatives to introduce our goods to those who are only too anxious to take advantage of the benefits to be derived from the use of our products. If they knew of the many advantages to be gained from using, in this particular instance, electricity as a lighting, heating and manufacturing agent, more current would be sold. As one writer has aptly stated, "the electric company was once looked upon merely as a corporation with a franchise permitting the manufacture of electricity which was metered to the consumer and promptly billed, at the first of each month. The transaction to some extent was surrounded by a veil of mystery. Years ago the high price of electricity and the limited number of appliances gave little incentive to companies to energetically exploit the sale of electricity." To-day the advanced companies are trying to remove the veil.

Electric companies, aside from being public corporations, are much the same as other manufacturers. They have something to sell. They are commercial institutions. With the inauguration of the new business departments, or sales departments, in connection with the electric light companies, or central stations, the public has been educated to realize that it is dealing with commercial institutions who manufacture electricity for light, heat and power. Up-to-date advertising and selling methods have been adopted and commercialism on the part of the central station is now greatly appreciated by the public.

In many of the largest cities in Ontario the public is now being educated to the proper uses of electricity, and the mechanical perfection of modern electric lighting, power and

heating appliances has created a new era in central station business. There are nearly 9,000 residence consumers alone in the city of Toronto, or about one house in every nine is lighted by electricity, and it is stated that there are over 3,000 electric flat irons in use to-day. The success of the large companies can be duplicated in direct proportion by the electric light companies operating in smaller towns and cities. As an instance of this, let us take, for example, the great insurance companies. They employ solicitors in every city, large or small, in which they do business. These men are given definite sections or territories, and work from house-to-house, store-to-store, office-to-office, day and night to secure business. As evidence of their success, I would refer anyone interested to the yearly reports of the different industrial and old line companies operating in the Dominion. One of the vice-presidents of the greatest company operating in the world to-day, stated at an insurance investigation carried on in New York State, that without solicitors, the insurance companies could not get business. The same applies to the electric light companies. It is tacitly admitted that an insurance policy is an absolute necessity. So is electricity. Yet men must be employed to prove to the satisfaction of the average man that insurance is a necessity, and men must be employed to prove to the same class of people that electricity is a necessity.

Business must be cultivated; of that there is no question. The day when we could sit back in our office chair and wait for it to come to us is past. We must go out into our city and secure new trade channels. You know your office is at a certain corner, but does everyone else? More women know of Brown's dry goods emporium or Limberger's "New York Store," than they do of the far off electric light company's office. Why do they know of the department stores and not of your institution? Because the merchants have advised them through the columns of the newspapers, circular matter, electric signs, etc., that they are there and waiting for their money. You can do the same. The purpose of this paper is to tell you how.

Always Two Ways Of Doing Business

There are two ways of cultivating business, just as there are two ways of doing anything else. There is the wrong way and the right way. The wrong way, as has been said, is to sit and wait for business to come in. The right way is to go out and get it. A writer in "Vim," a publication issued by the Curtis Publishing Company, of Philadelphia, Pa., calls the right way, "Intensive Cultivation," which simply means finding the sections of your town where contracts will grow best and then going out and getting them in proportion to the fertility of the district. It is acknowledged that electricity is superior to any other power or lighting controlled by man, but it takes this cultivation to convince everyone that it is an absolute necessity, as it really it. For instance, let us assume that there are 70,000 families in a town. We will say that the electric light company supplies about 6,000 of these, or one family out of every twelve, but at the same time there are a number of families who are living in houses that are wired and are not using electricity. Those are the ones to get after. Focus your efforts on the wired houses. Seven-eighths of the work is complete. All that is necesary to do is to install the fixtures, put in the meter and start to sell current.

You will secure more customers in some localities than in others. Your men must make extra efforts to boost business in places that are falling behind, but in which you have poles and lines. A careful analysis of the increased business will prove to be due to the efforts which your agents are making and which you can use in measuring the proportion that their contracts bear to the population. It will, of course, be necessary to consider the class of business in each unit. For instance, in a district where the residents are all people in comfortable circumstances, there should be a meter in every household. Of course, there will be districts and parts of districts where there are certain people, foreigners, etc., which will make it impossible for your men to get contracts in anything like the same numbers that they can be gotten in the better class of residential sections. But, in the poorer parts of a town are the factories. A specialist should be employed to go after these factories. He should be a first-class salesman with some practical and technical knowledge. Be careful that you do not employ a man who gives more time to the technical details than he does to general business principles. You know you can draw a line so fine that it will take a microscope to find it. Employ a broad minded, affable man to work on your power prospects.

Divide Your Town Into Districts

The town should be divided into districts and a man assigned according to the population. One man to every 10,000 of population is suggested. A card system should be used and a competent clerk should be employed to devote his time, or part of his time to the proper care of the cabinet. The writer insists that the salesmen in his department make out a card for every call, on which is written the name of the prospect, the address, class of business, the methods of illumination, or power employed for driving the machinery used, and the date of the call as well as the date on which the salesman considers most opportune to renew his line of argument with the prospect. It should be remembered that until every consumer has been induced to use electricity the territory is good. Salesmen are apt to become discouraged and can often make themselves believe that they have secured about all the business there is to be closed. Encourage your men with talks every morning.

Another illustration: Where a man has illuminated his store window with electric light, but is using gas in the interior, he should be shown the advantage of the former over the latter, and there is no better argument than that he is illuminating his window with the subtle fluid. Remember that one customer gets another. People are like sheep to a certain extent. They will follow the leader, and if you can show the little fellow that a hustling, progressive merchant has decided to use electric light for illuminating his store, office or residence, you have won half the battle.

Wherever there is a store in your town there should be an electrically illuminated window, and, if to your knowledge, a man can afford to install and illuminate an electric sign there should be one erected on the premises. In one large city in Ontario the soliciting department of the electric light company induced 165 merchants to install electric signs in ten months. These are of the flashing and constant burning type and have transformed the main street into a "Great White Way" of which any city may be proud.

It was stated to the writer by the manager of the most up-to-date and successful new business department of an electric light company operating in a large city in the Western States, that for every dollar invested in the new business department, $2.50 in net revenue was returned.

As the writer stated at the Canadian Electrical Association Convention in Muskoka, no matter how exact or how perfect the selling system is, first class salesmen must be employed to go out and get the business. Capable salesmen are very often not as brilliant engineers as they might be, but they have the business ability and are absolutely necessary to increase the revenue of your station. The private companies in Canada will have a great deal of competition in the near future. New business departments must be started if they are going to hold the business and secure the good-will of the community. Where there is competition a manager cannot afford to be a dead one. He has got to be an eager, active hustler, and go out and get business, and not be satisfied until he gets its and he must hang on like grim death after he has secured the business. Men must be employed who can influence the prospect with their personality as well as with the product. A man must be born with the love of barter and sale before he can sell. He must be intense and eager to get business, and it must be a hobby with him.

Municipal Illumination in Toronto

Present Lighting Contract Expired—Ornamental Posts for Main Sections
Tungsten Lamps throughout—Cement Posts first of their kind in Canada

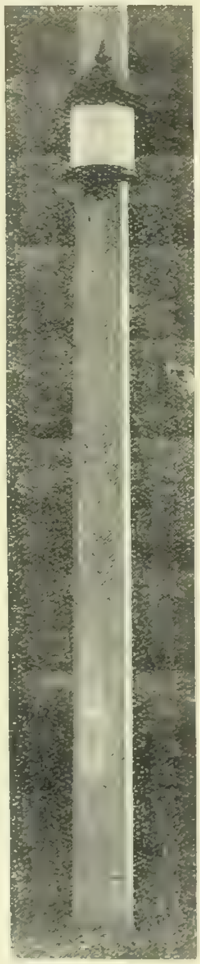
On January 1, 1911, the city of Toronto will take over from the Toronto Electric Light Company, whose franchise then expires, the lighting of all Toronto's streets. It is just possible a number of the streets will be without proper illumination for a few nights, but poles are being placed by the city Hydro-Electric Department at a very rapid rate. Many of the streets have been ready for some weeks.

The system to be used in Toronto will combine a pleasing appearance with effective illumination. The appearance of the lamps is shown in the accompanying figures. The artistic 5-lamp standard shown, is at present installed on King street, where its illumination effect has been demonstrated for several nights. This type will be used on the principal streets of the city, and placed from 80 to 100 feet apart.

It will be remembered that the distribution of power and light in Toronto is partly by underground conduit and partly by overhead wires. The area covered by the underground system will correspond with that to be lighted by these ornamental 5 light standards.

In that part of the city where distribution is by overhead wires the other type of lamp shown, mounted on a cement pole, will be used. One of the figures shows a complete pole with the method of carrying the wires. The poles were manufactured by the city of Toronto. The lead wires pass from the distributing lines above, down the middle of the cement pole (which is cast enclosing a conduit tube for the purpose) to the lamp below, about 12 feet from the ground. Only the one type of pole will be used, but one, two or possibly three, lamps will be mounted on each pole according to the requirements of the section.

Cement Post
Side View



Cement Post
Front View

Cement Post
Full length

Ornamental
5 Light Post

These cement poles, while not so attractive as the ornamental standards, are, nevertheless, decidedly less objectionable than the ordinary wooden pole. They are an entirely new idea, originating with the management of Toronto's civic lighting department and reflect great credit on this management.

The cement poles will be placed generally 100 feet apart, and in most cases on both sides of the street. Greater illumination will be effected by more lamps on each pole, as noted above, or by the use of larger units. These lamps will be tungsten and will vary in size from 60 to 100 c.p. The ornamental standards will generally carry four 80 candle powers and one 100 c.p.

The underground distribution is at 550 volts, so that the five lamps on the ornamental poles will be series connected 110 volts

each. The overhead distribution will be three wire 110 and 220 volts and where more than one lamp is used on a cement post they will be multiple connected.

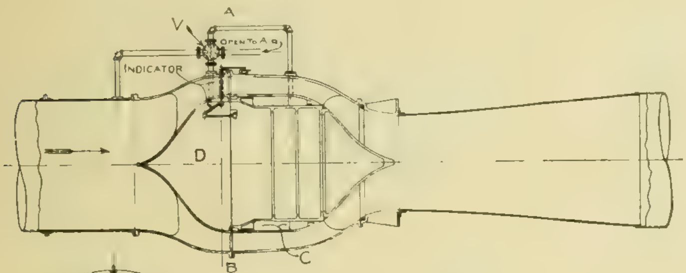
The business manager of Toronto's civic electric lighting system is Mr. W. R. Sweany, late of Savannah, where he was connected with the immense engineering firm of Hore & Webster. Present indications are that Mr. Sweany is constructing a lighting system in Toronto which will prove highly satisfactory

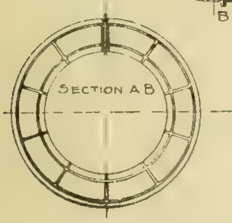
Pressure Valve for Control of Water Flow

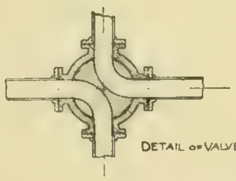
Gives Perfect Control—Operated from any distance—Ideal Shape for Cheap Manufacture — Model Operating at Niagara Falls

The accompanying sketches illustrate the construction and plan of operation of a new pressure valve now being tried out by the Ontario Power Company's works, Niagara Falls, Ont. The valve is the invention of Mr. R. D. Johnson, hydraulic engineer, of the Ontario Power Company. The English patents have been taken out by Mr. Johnson in partnership with Mr. Boving, of the Jens Orten-Boving Company, which company will exploit the valve in Europe and Canada. For the United States the inventor intends to retain the patents in his own name. The model now in operation at Niagara Falls is working with entire satisfaction and its combination of simplicity and efficiency is calling forth warm expressions of praise from the engineers who have witnessed the demonstration. The descriptive matter which accompanies the cuts will, it is believed, be found amply sufficient to explain the operation of the valve.

A number of the advantages which may, we believe, be justly







Indicator may be attached to control valve to exclude possibility of main valve creeping from any desired opening.

If water is free to flow when main valve is open chamber "C" may be omitted by merging it into chamber "D." Its presence is desirable as an efficient factor of safety.

The valve "V" in the position shown reduces the pressure in the annular chamber "C" to atmospheric and main valve closes due to full pressure transmitted into chamber "D." Reversing the control valve, reverses the pressure and main valve opens.

claimed for this valve are given below. The advantages are apparently equally applicable to all sizes and to all pressures.

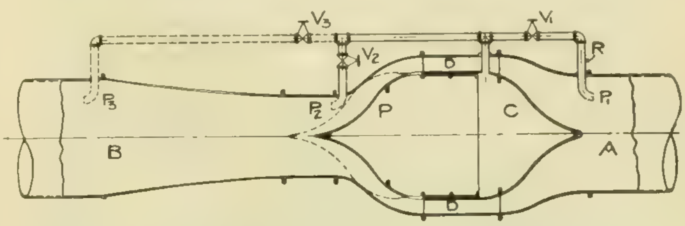
1st. All cross sections are circular, which is the ideal shape for cheap manufacture and minimum material to take care of stresses.

2nd. Perfect control, doing away with motor drive and multiplicity of gearing necessary to move a large gate valve.

3rd. Balanced pressures, avoiding any tendency to wear or cut. That is, the water pressure does not affect the sliding friction.

4. The venturi outlet recovers the head due to the increased velocity at the neck of the valve and the smooth flow makes the loss of pressure about 10 per cent. as much as in the ordinary valve.

5th. Applicability to remote control. It is quite as safe to operate this valve from a point a mile away as along side of it.



Operation, Flow from "A" to "B"—The operation of the valve is due to difference of pressures caused by changes in velocity of the water in the valve case (venturi effect).

Opening Effort—The start to open is due to the static pressure on the submerged surface of the plunger above the valve seat.

Closing Effort—The closing effort equals the static pressure inside the movable plunger.

To Open Valve—With the connections shown in solid lines and flow from "A" to "B" with or without pitometer tubes P1-P2. To open valve: close control valve V1 and open V2.

Operation, Flow from "B" to "A"—With the flow from "B" to "A" pitometer tubes or additional connections shown in broken lines are used. Opening and closing efforts—same as above.

To Open Valve—Open V1 whilst remaining valves are closed.

To Close Valve—Open V3 or V2 whilst remaining valves are closed.

Opening Without Connection "R"—With the flow from "B" to "A" and connections shown in solid lines valve may also be opened without connection "R" to downstream end of valve case by closing V2, as sufficient water will leak through packing of plunger to allow valve to open.

Closing Without Connection "R"—Under above conditions valve may be closed by opening V2 and using pitometer tube "P2" thereby obtaining the dynamic effect of the water. Or valve may be closed by opening "V3" and using connection shown in broken lines without using pitometers.

This may be accomplished in many ways by electrically actuating the small control valve.

6th. This valve requires no by-pass to equalize the pressure on both sides of the gate previous to opening.

Liability for Another Firms Employe

The recent legal case, Rorison vs. Butler Bros., an action by the mother to recover damages from the latter company for the death of Rorison, a workman, resulted in judgment for the plaintiff for $4,000.

The case was peculiar in that Rorison was not employed by the firm of Butler Bros., but by another contracting company on the same work. The responsibility arose, however, in the fact that the operators of a derrick used by Butler Brothers undertook to raise the workman Rorison from the pit to the surface, and in so doing rendered the company liable. The case will be appealed on the ground that the assessment is excessive.

Mr. Pritzker, of the National Electric Heating Company, Galt, Ont., will make a business trip to Montreal and other eastern cities during January.

The Booster in Modern Load Regulation

Saving in Capital Outlay — Economy in Operating Expenses—The Function of a Booster Plant Outlined—Entz Type of Booster Described

By A. E. Wilkes

It is important to note the progress being made in storage battery usage in recent years, more especially in connection with the regulation of power loads by the aid of bootsers. At the present time this system of regulation is more directly concerned with traction loads, under which category we might include industrial works running heavy machinery, such as steel manufacturing and rolling, air compressors, ship building apparatus, street railways, large elevator loads, etc.

One of the most forceful arguments, too, in favor of a booster battery system is that on a heavily fluctuating load, where a battery plant can be installed so as to take all the peaks, a large saving in capital outlay results, since it is only necessary to install generating plant sufficient for the average load. Further, there would be not only a reduction in size of boilers, rotaries or motor generator sets, but, as well, an economy in operating expenses, all of which sometimes amounts to as much as 25 per cent.

It is not possible, of course, to state definitely the exact economy to be obtained from the installation of a storage battery and booster without a careful study of the conditions existing in each individual plant, but a particular instance, known to the writer, of a booster battery plant flattening the peaks of a generator load on a street railway illustrates the principle sufficently well. To handle the load of this particular system at such times as the traffic was heaviest, two 800 k.w. steam-driven generators were required, for which the average coal consumption per k.w.h.

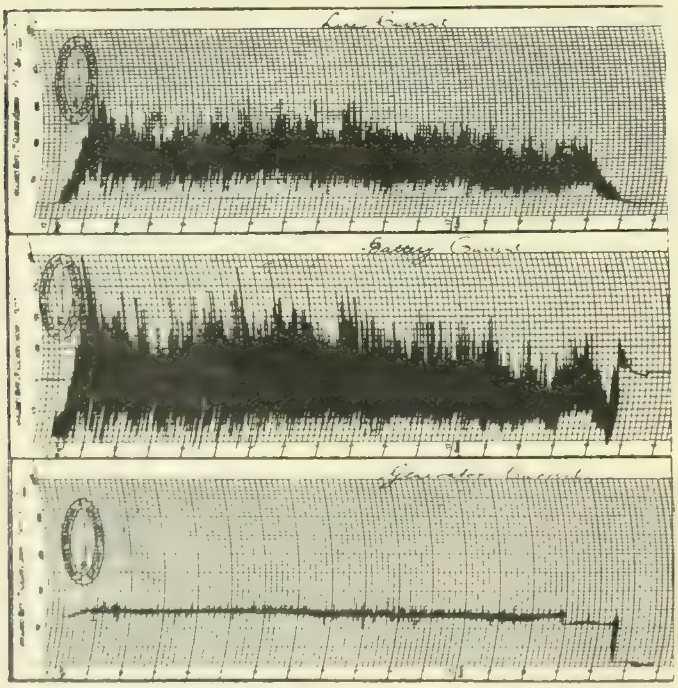


Fig. 1

was 3.3 lbs. In view of the peculiar character of the load this was not by any means a bad figure, but by removing the peaks from the generating plant with a booster battery plant, the coal consumption was reduced to 2.69 lbs. per k.w.h., or near 20 per cent. At periods of light load with one generator running, the average coal consumption was [illegible] lbs., which was reduced to 3.66 lbs. by relieving the generator of the peaks, an economy in this case of 22 per cent.

In determining the size of a battery to deal with peaks on a fluctuation load it is necessary to ascertain the mean (average) load as well as the peaks and dips, which factors, with a margin for contingencies, determine the size of a battery that at the one hour rate of discharge will give the current represented by the mean (average) load and the normal. Take as an example, the first curve in fig. 1. This indicates line current varying from 500 amperes above to 200 amperes below the average line load. A battery capable of maintaining 700 amperes for one hour and capable of being charged, momentarily, at 250* amperes would maintain the generator load steady at about 300 amperes. The action of the battery is indicated in the second curve of fig. 1. The absorption of peaks by the battery allows the generator to run on steady load as indicated in the lower curve, fig. 1.

The Entz Booster.

It is essential that the booster used for this class of work be instantly reversible and capable of regulating fluctuations with-

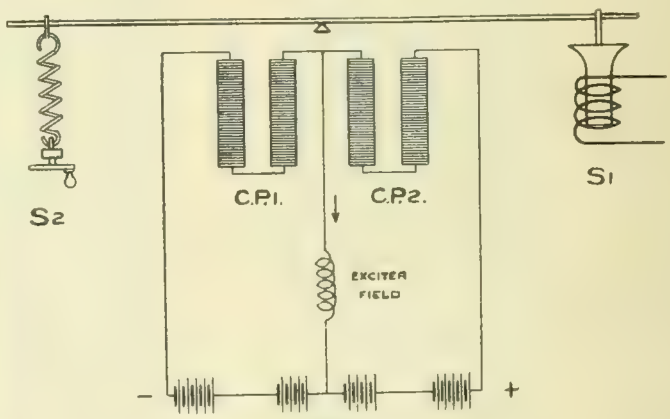


Fig. 2

out any adjustments being necessary as the load varies and the state of the charge of the battery alters. A booster that has given good satisfaction and is widely used in Canada and the United States is the "Entz," of which the chief adjunct is the carbon pile regulator. The instantaneous reversibility of this machine is controlled by a small exciter, the field of which is energized by the current passing through the carbon piles, which are compressed at the moment a boost is required. The carbon pile regulator does not occupy any more space on the switchboard than a watt hour meter. The regulator consists of two piles of carbon discs. Between the two sets is pivoted a lever, from one end of which is suspended a soft iron core surrounded by a solenoid carrying the entire generator load. To the other end of the lever is attached a spiral spring, the tension of which is regulated to counterbalance the pull of the solenoid. This enables any load to be allotted to the generator. Any variations

*This charging rule may be a trifle different according to various battery manufacturers' products, but this is the "chloride." So long as a battery can be charged at about this rate (in order to compensate for the discharge), then it is the proper battery to select. I might have said, "A battery capable of maintaining 1,400 for one hour would keep a steady generator load of 600 amperes with a battery capable of being discharged at the above rate and charged at 700 amperes, because 700 amperes is a safe charging rate for a battery capable of discharging 1,400 for one hour."

in the load above or below this fixed generator will therefore change the pressure on the carbon piles, resulting in wide variation in their contact resistance.

Advantage is taken of this resistance variation in the carbon piles to control the field excitation of the booster through the intermediary of a small exciter, the field of which is the middle wire of a three wire system as shown in diagram in Fig. 2. In explanation of the diagram, if the pull exerted by the solenoid

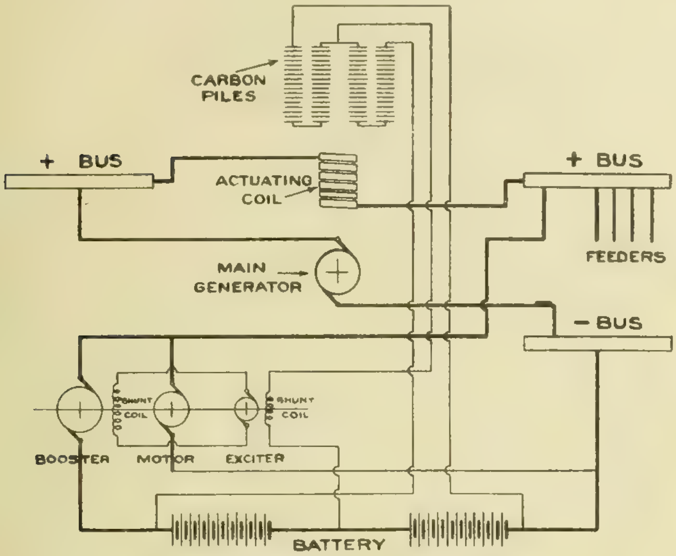


Fig. 3—Diagrammatic Connections

S_1 on the lever, of the carbon regulator overcomes the spring S_2, the carbon piles C.P.$_2$ will be compressed and C.P.$_1$ released, the result being that the direction of the current through the exciter field will be as shown by the arrow. If the spring S_2 overcomes the pull of the solenoid, then the direction of the excitation will be reversed. When the desired average load is on the generator, the pull of the solenoid and the spring counterbalance each other, and, as then the resistance of the carbon piles is equal, the booster field is not excited. When the line load rises above the average and the load on the generator tends to increase, the pull due to the increase in current flowing around the solenoid overcomes the tension of the spring at the other end of the lever; this compresses the carbon piles on one side and allows current to flow in the field of the exciter in a direction which will energize the booster field coil in such a manner as to add to the voltage of the battery and cause it to discharge. The carbon regulator will so adjust the booster voltage that the discharge from the battery plus the average load on the generator will equal the line load. If the load should fall below the average, the generator output would tend to drop and the spring at one end of the lever of the carbon regulator will overcome the pull of the solenoid. The carbon piles of the regulator on the side which was in part released when the battery was discharged will then be compressed and the battery will now receive a charge equal to the difference between the average generator load and the line load.

Fig. 3 shows diagrammatic connections of booster, motor and exciter on same shaft. It will be observed that one bus bar is divided and the actuating solenoid carrying the generator current is inserted. The battery is connected across the main bus bars in series with the armature of the booster, which has only one field coil, separately excited. The absence of any series windings in opposition to the shunt coil and of adjustable resistance will be appreciated.

The field of the exciter is energized by a portion of the main battery, and in order that the main battery shall be equally worked, switching arrangements are provided, so that the particular cells for this purpose may from time to time be changed. The load to be taken by the generator may be adjusted to any desired amount by varying the tension of the spring at the end of the lever which regulates the pressure on the carbon piles. This adjustment is made by a small handwheel and may be altered from time to time to meet any considerable changes in the nature of the load, so that the battery can be either floating, giving continuous peak discharge, or being charged according to the adjustment, while always automatically taking the momentary fluctuations of the load.

The output of the exciter is almost infinitesimally small as compared with the booster it controls. For a 500 k.w. booster it would only be 2.5 k.w., and it is obviously a quicker operation to reverse a machine for 2.5 k.w. than one of 500 k.w. In order to eliminate any possibility of lag in reversing, the exciter is designed to give three times the excitation volts necessary to give the required boost across the booster armature, thus ensuring instantaneous response, the carbon regulator automatically throttling the excess when the correct boost has been reached.

There is only one field winding on the booster which is positive

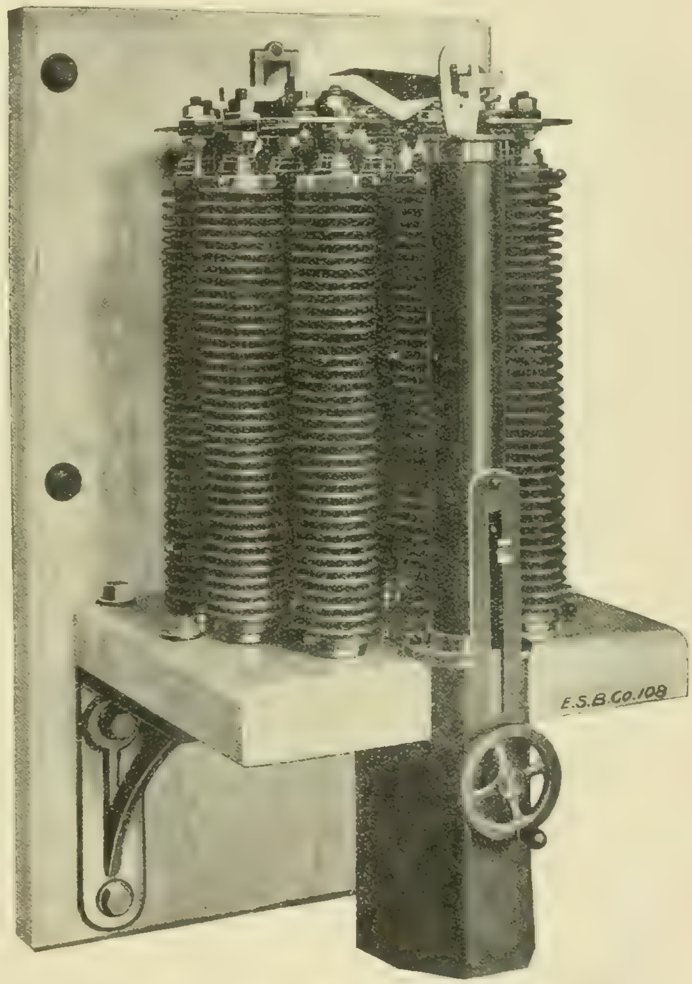


Fig. 4 The Carbon Regulator

in its actions, as there are no other windings to oppose it. There is no series coil in opposition to the shunt coil and tending to neutralize it, and it follows that the excitation watts are reduced to a minimum.

Regulation of A.C. Loads.

In the foregoing, we are, of course, dealing specifically with straight D.C. loads, but during the last three or four years marked advances have been made of equal importance and with equal success in the regulation of alternating current lines. Perhaps the most notable instance of A.C. regulation is to be found at the Indiana Steel Works, Gary, Ind. The fluctuation of the load is approximately 3,000 k.w., and there are two large bat-

teries with regulating devices to handle these fluctuations. The A.C. regulating system in this case does away with the booster and consists of a new split pole rotary converter. The poles of this machine are divided into two or three sections, as best fits the occasion. The theory of this machine is rather complicated, but briefly, means are provided for varying automatically the distribution of the magnetic field flux in the converter to vary the potential across the direct current brushes, keeping the potential across the three-phase brushes constant. In this way a variation of 20 per cent. above and below the mean D.C. voltage can be obtained with practically no variation of the alternating current voltage. This will allow the battery to feed in and out of the converter. The variation of field excitation is obtained by means of an exciter consisting of an A.C.-D.C. generator operated by a synchronous motor. The A.C. brushes of this generator are connected to series transformers in the generator circuit. As the generator is revolved, the current from these series transformers causes a north and south pole in the exciter generator. This north and south pole is neutralized by a D.C. field winding on the generator and two brushes which would under normal circumstances be the collector brushes of the D.C. side are short circuited. Two other brushes at right angles to these brushes are connected to the variable field of the rotary. When the generator current tends to increase due to fluctuation, the current in the series transformers also increases and the neutrality of the exciter field is overcome. This causes a rush of current through the short circuited brushes, which causes a heavy field due to armature reaction in the exciter. The auxiliary brushes thus receive a high voltage and this voltage is applied to the converter field in a direction to lower its D.C .voltage, thus allowing current to flow from the battery into the converter assisting the generator. When the outside load drops and the generators are relieved of their loads, the fixed field on the exciter overcomes the field due to the series transformers and the varying converter field is excited in the opposite direction, tending to raise the D.C. voltage and charge the battery. In this manner regulation of the A. C. system is obtained.

As in this particular system there is also a certain amount of D.C. load of a fluctuating character, the installation has in addition a small D.C. booster which regulates this load. The battery, therefore, at times regulates both A.C. and D.C. fluctuations. The battery in question has a capacity of 16,000 amperes under ordinary regulating conditions.

It will therefore be noted that a storage battery has the following functions on an A.C. load:

1. Regulation at end of line.
2. D.C. power house regulation.
3. A.C. power house regulation.
4. Combination of both A.C. and D.C.

In all these cases the battery can also be used as a reserve in case of breakdown while getting another apparatus into service.

There is still another important adjunct to storage battery practice—the Automatic Average Adjuster—a device which may be attached to a carbon regulator or other regulating apparatus, and which serves to vary, gradually, the load on the generator so as to follow changes in the average external load. This relieves the battery of unnecessary work in the form of sustained charges and discharges, thus improving efficiency in operation, preventing overcharging, keeping the battery fully charged, and permitting it to take all of the quick fluctuations of the load. It is the intention of the writer to deal with this piece of apparatus in another issue.

International Electro-Technical Commission

The Object to Establish International Standards—Progress to Date—Next Meeting will Deal with Electrical Machinery—Cordial Relations between different Nations

By Ormond Higman.

Electrical machinery and apparatus have become so essential to any engineering project that the establishment of an international agreement as to the exact meaning of the terms, the rating and the general methods of testing electrical machinery are becoming of world-wide importance.

It would undoubtedly be of great advantage to an engineer if he were able to draft his specifications in terms which were practically identical with the terms in use, not only in his own country, but also in other countries in which similar apparatus is employed. What an amount of misunderstanding would be avoided if this were made possible!

Again, it could not but be of great benefit to the purchaser as well as to the maker if electrical machines were rated in a similar manner in all countries. At present this is not the case. For instance, a 10 kilowatt motor is not necessarily a 10 kilowatt motor in all countries, due to the different basis upon which the machine is tested to ascertain its power or output. Yet the physical tests which determine the output of that motor and upon which the power is based should surely be the same all the world over.

Now, it is well known that these various problems have received much study and attention. The Americans, however, were the first to seriously consider the question of the classification of electrical machinery, and the American Institute of Electrical Engineers adopted a report of a committee under the chairmanship of Dr. Francis B. Crocker in 1899. Gradually different countries followed suit and drew up reports which have been of undoubted assistance to the industry adopting such reports.

In 1901, under the auspices of the Institution of Civil Engineers, the British Engineering Standards Committee was formed, Sir William Preece, K.C.B., and Col. R. E. Crompton, C.B., being nominated as the representatives of the British Institution of Electrical Engineers on that body. The excellent work of that committee is well known and need not here be referred to in detail.

At the St. Louis International Congress of 1904 Col. Crompton presented a paper on the rating of electrical machinery which gave rise to much discussion. Many delegates felt that the time had arrived for considering these various problems internationally and that if international co-operation on a proper and permanent basis could be secured, success would be bound to follow.

It was quite recognized that the various congresses held from time to time were of too short duration to allow of the different problems submitted to them being studied to any depth, and consequently the Chamber of Government delegates of the St. Louis Electrical Congress passed a unanimous resolution proposing the formation of an international commission with a permanent organization capable of giving the continuous effort so absolutely necessary for the solution of these and kindred problems.

The foregoing are, briefly put, the facts which have gradually led up to the formation of the International Electrotechnical Commission.

Although much time has elapsed since the St. Louis Congress, the time has been well spent, for it has been occupied in the general organization of this commission, which, in itself, has been no small matter when one considers the distances separating the correspondents, the difficulties to be overcome, and

the explanations to be given to people of different nationalities.

Nor can it be said that the commission is not in a fair way towards accomplishing practical results. The subjects at present under discussion and upon which definite resolutions are to be promulgated in 1911 at a full meeting of the commission to be held at Turin, are nomenclature, symbols, the direction of rotation of vectors and the rating of electrical machinery. In regard to the extremely difficult subject of nomenclature, otherwise terminology, a large amount of preliminary work has already been accomplished and several countries have drawn up an alphabetical list of terms with their definitions. These various lists have, however, proved most difficult of comparison, and in order therefore to hasten international agreement upon a more practical basis, it has been decided, at the recommendation of the Germans, to discard, for the time being, the alphabetical method and to draw up definitions of a list of some eighty terms dealing with one subject alone. The subject at present in hand is that of electrical machinery. This very practical method is certain to produce early results, because dealing with one subject at a time implies a sequence of ideas quite impossible of attainment when the alphabetical method is considered.

In regard to symbols, the commission intends to adopt, first of all, a certain number of general rules dealing with principles and this should much facilitate the choice of the actual symbols themselves. It is interesting to note how cordial are the relations between the various sections of this commission. The spirit of concession so clearly evidenced by the various members in their readiness to co-operate and to give way on matters of detail augurs well for the continued success of the movement. The fact that the French have lately hinted that they would be quite prepared to consider the adoption of ''C'' for current if our German friends would adopt ''R'' for resistance, should bring within measurable distance the happy day when the simple expression of Ohm's law will be rendered in identical symbols all over the world.

When once the commission has given authoritative decision as to the direction of rotation of vectors, much of the present difficulty in reading the books of specialists in alternating current work will be done away with, and the international agreement upon electrical symbols generally must prove an immense boon to all students of electricity.

The international rating of electrical machinery can only come by degrees, for the conditions and usages of different countries have all to be considered. It is, in fact, a matter of general education, for no decisions can be arrived at internationally without both the purchaser and manufacturer being consulted, and consequently it is only as each country gradually perceives that the international rating of machinery does not in any way imply interference with design or progress, nor mean the drawing up of commercial regulations governing contracts, that this subject can be entered into in detail, and prove of material assistance to those specifying electrical machinery. At the same time it is noteworthy that at its next meeting the commission proposes to adopt the international ''watt'' as the unit of electrical and mechanical power, thus signalizing the passing of the undesirable and unscientific expression ''horse power.''

It bears repeating that this movement owes its inception to the St. Louis Electrical Congress of 1904, and in large measure to the paper which Colonel Crompton then presented.

A preliminary meeting was held in London in 1906, and Mr. Alexander Siemens, this year's president of the British Institution of Civil Engineers, took the chair. Fourteen countries were represented. Statutes were drafted and the commission was practically instituted with Lord Kelvin as its first president and Col. Crompton as its first honorary secretary. The central office was established in London, and English and French were adopted as the official languages. The latter point was gained because of the extraordinary facility for languages which is the happy possession of the German, and was largely due to the unfailing courtesy of the German delegates.

A first council meeting was held in London in October, 1908, when Mr. Arthur Balfour, former Prime Minister, addressed some forty foreign delegates, and Professor Elihu Thomson, U.S.A., was elected president. It should, however, be mentioned that, had he lived, M. Mascart, the life-long friend of Lord Kelvin, would have succeeded him.

There are in all sixteen countries in which an Electrotechnical Committee is established and in direct communication with London. These committees have a large measure of government support. The various government representatives on the committees are of great assistance to the work, and the government support helps to give a standing in their own country to the various committees. The British Indian Government are aiding the commission financially though without forming a committee. In the Argentine, Australia, Chili, Peru, South Africa and Switzerland there is likelihood of a committee being formed. In Holland and Russia a committee is now practically nominated.

An unofficial conference of the commission was held at Brussels in August, 1910, under the presidency of M. Eric Gerard of the Liege University, and excellent work was accomplished which has been favorably commented upon by the technical press in different countries. A full meeting of the commission is to be held at Turin, Italy, in the autumn of 1911, when, amongst other matters, the tentative resolutions adopted at Brussels will come forward for ratification. In the meantime, those tentative resolutions are being submitted to the Electrotechnical Committees in the various countries, but as the resolutions were arrived at unanimously, the committees should not experience any serious difficulty in adopting them.

It cannot but be admitted that the generous support which the Electrotechnical Commission is meeting with in the various countries and the cordial way in which the delegates are conducting their deliberations is bound to lead to useful and practical results. This promotion of a better understanding between electricians of various nations by general agreement as to terminology and classification of electrical machinery is sure to foster the free development of international trade, to be a general benefit to the industry at large, and last, but by no means least, to be a factor in furthering the peace of the world.

Useful Table of Facts

The following table will be found of value in making rough calculations such as, for example, on the size of wire necessary to carry a given current. It must be understood, however, that many of the figures in the table vary with conditions.

B & S Gauge No	Diameter in Mils or Thousandths of an Inch	Area in Circular Mils	Ohms Per 1,000 Ft	Lbs Per 1,000 Ft. W P Ins	Safe Amperes Rubber Covered	Weather proof
...	1,000	1,000,000	.01038	3,550	650	1,000
..	894	800,000	.01297	2,880	550	840
...	775	600,000	.0173	2,210	450	680
.	707	500,000	.02076	1,875	390	590
..	632	400,000	.02596	1,530	330	500
. .	548	300,000	.0346	1,185	270	400
0000	460	211,600	.04906	750	210	312
000	410	167,805	.06186	600	177	262
00	365	133,079	.07801	500	150	220
0	325	105,592	.0983	400	127	185
1	289	83,694	.1240	300	107	156
2	258	66,373	.1564	250	90	131
3	229	52,633	.1972	200	76	110
4	204	41,742	.2487	160	65	92
5	182	33,102	.3136	140	54	77
6	162	26,250	.3955	110	[illegible]	65
8	128	16,509	.6288	75	33	46
10	102	10,381	1.	50	24	32
12	81	6,530	1.590	35	17	23
14	--	4,107	2.591	25	12	16
16	51	2,583	4.019	16	6	[illegible]
18	40	1,624	6.391	12	3	[illegible]

Bristol's Recording Gauges.—Bulletin 140, issued by the Bristol Company of Waterbury, Conn., giving complete illustrated descriptions of this company's various types of pressure gauge.

Producer Gas Plant—What is a Producer?

By W. S. Haggas, A.M.I.Mech.E.

For the benefit of those who have so often asked the question, "What constitutes a producer gas plant," the writer will endeavor to give some simple illustrations and explanations of the principles upon which such a plant is operated, omitting for the most part all technical and chemical terms.

To begin, allow me to point out that a producer gas plant is composed ordinarily of three distinct and separate pieces of apparatus. First, there is the gas producer (from which the name producer gas appears to have been, capriciously enough, derived), that part of the plant which roasts the gas out of the coal; second, there is the gas engine, which utilizes the gases just manufactured by the producer; and last, there is the electric generator, which is operated by the gas engine to supply light and power.

These three separate units, though often operated together, nevertheless lend themselves to a varity of other combinations, as may be seen from the following summary:

1. A gas producer may be operated alone to supply gas for heating purposes.

2. A gas producer may be operated partly to supply gas for heating purposes and partly to operate a gas engine of lower capacity.

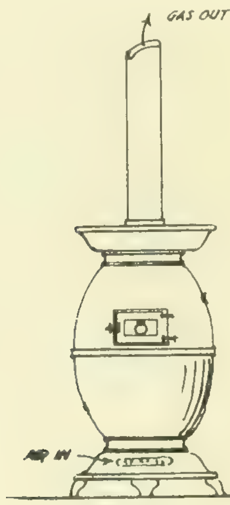


Fig. 1

3. A gas producer may be used to operate a gas engine of the same capacity for power purposes only.

In the present article it is the intention to deal only with the question of a producer gas plant in so far as it treats of the gas producer itself, leaving till a later date the discussion of the gas engine.

There is probably no apparatus used in connection with the production of power that at first appears more full of mystery, but which in reality is so simple as the gas producer.

For example, let us take the ordinary old-fashioned coal stove (Figure 1). Let us suppose that the fire pot is about half full of burning coals, with the draught turned full on, so that a good hot fire is produced. Now put on another layer of fresh coal several inches deep so that the fire is well covered up, close the door and any other openings about the upper part of the stove, so as to make it as nearly air tight as possible, leaving the draught full on. After a few minutes open the small damper in the door just enough for a peep hole, so that you can satisfy yourself that there is no sign of fire in the upper part of the stove. Next open the door wide and immediately there will be a slight explosion due to the air rushing in and mixing with the gas[1] that is being produced. This mixture of air and gas will continue to burn while the door is open, so long as the fire below is hot enough. The fact of the door being open, however, practically stops all draught through the fire and it soon cools off.

Let the reader just stop here for one moment to ask the question, "What was actually taking place before the stove door was opened? The thoughtful individual will at once arrive at the right conclusion—the very best part of the fuel was going up the chimney in the form of a combustible gas. It would be quite possible to ignite this gas and have it burn at the top of the chimney, where it would get the necessary air. Keep in mind the fact that the gas will not burn without air any more than air will burn without first being mixed with the gas.

There are two distinct types of gas producer—pressure and suction—but the principles upon which the gas is generated are the same.

Fig. 2 represents a simple form of gas generator similar to the generating section of the modern pressure gas producer. This is simply a shell lined with fire brick and provided with grate bars, cleaning out doors at the bottom, and a means of supplying coal from the top, through a hopper which, after it is filled with coal and the lid on top of same has been closed tight, the coal is allowed to drop into the generator through a trap or valve which is opened by raising the lever provided for this purpose. In this way coal can be fed to the producer while it is in operation without interfering to any extent with the quality of the gas, as in the case of the suction gas producer, which operates under a partial vacuum, the air is prevented from entering the producer, which it would do if the valve and top lid of hopper were open at the same time.

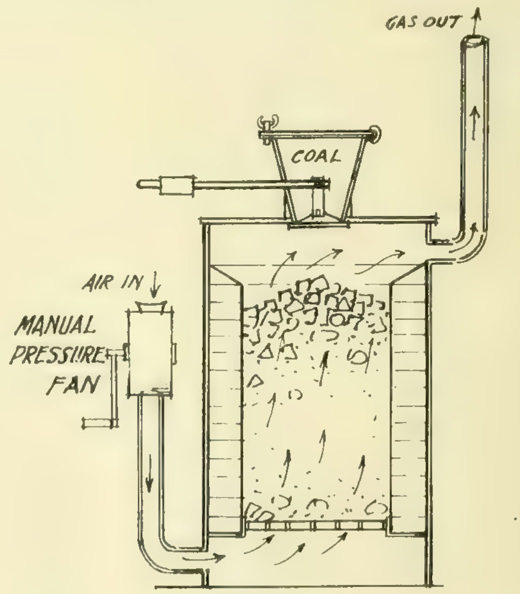


Fig. 2

The draught is created by a small hand fan which forces air up through the grates and keeps a hot fire at the bottom of the bed of coal, the combustible gas[2] being driven up through the pipe running from top of producer, and as the gas leaves this pipe and mixes with the atmosphere it will burn freely if ignited. This constitutes a very simple form of the pressure gas producer.

In Fig. 3 we have gone a step farther and have added a water compartment to the upper part of the gas generator. The object of this arrangement is two fold. By making this compartment a part of the top itself it prevents the escape of considerable heat. The main object, however, is to generate a small

[1] and [2] This is chiefly Carbon Monoxide—CO.

amount of steam for the purpose of enriching the gas. It will be noticed that there are no openings at the bottom of generator the cleaning out doors being kept closed tight while producer is in use, except when it is necessary to open them for cleaning purposes, and the only way air can get to the fire is by passing in at the elbow on top of generator, then across the top of the water and through the pipe down to the ashpit below the grates. In doing this it carries a quantity of steam which in passing up through the incandescent bed of coals enters into the composition of the gas[3], adding considerably to its heat value.

So far as the actual production of gas is concerned, Fig. 3 presents a complete and modern type of suction gas generator, the draught being created by the suction of an ordinary exhaust fan.

The heavy fire brick lining serves the double purpose of holding the heat in the generator and allowing a much hotter fire than would be possible in Fig. 1. Their relationship, however, is quite apparent.

Fig. 4—a section view of a complete Keighley suction gas producer—only differs from Fig. 3 in its carefully arranged super-heater, scrubber, and expansion chamber. This producer is designed especially for supplying gas for power purposes in

It will readily be understood that by cooling the gas it has contracted and is therefore stronger (as we say) that is, a given volume of cool gas will possess a greater expansion capacity than would be procurable from an equal volume of hot gas. For this reason it is desirable to have the gas cold before it enters the cylinder of the gas engine, where the necessary air is supplied to form the explosive mixture. This mixture is compressed in the same manner as the mixture of gasoline and air is compressed in the ordinary (four stroke cycle) gasoline engine.

In the Keighley engine the mixture of gas and air is ignited at the proper time by means of a powerful trip magneto, no battery of any kind being required, but this will be explained in its proper place.

It might be mentioned that the hand fan shown on Fig. 4 is for the purpose of blowing up the fire in order to make it hot enough to produce good gas before starting the engine. During this operation the poor gas is allowed to escape through the chimney pipe to the open air. A small test cock is provided on outlet pipe within easy reach of the man turning the fan, and he can light the gas here while fan is being turned just as soon as fire is hot enough to produce it. These starting fans are

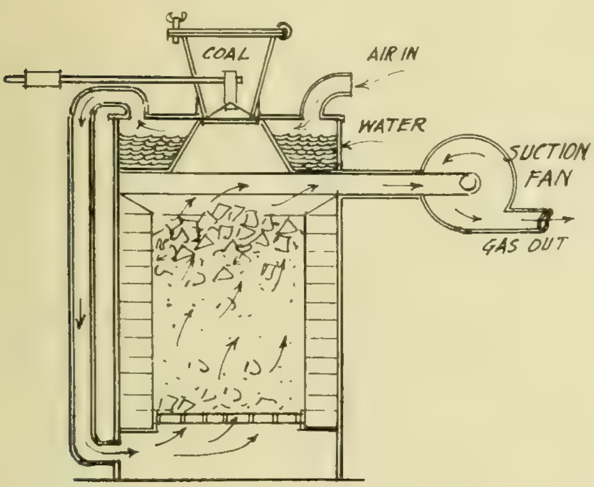


Fig. 3

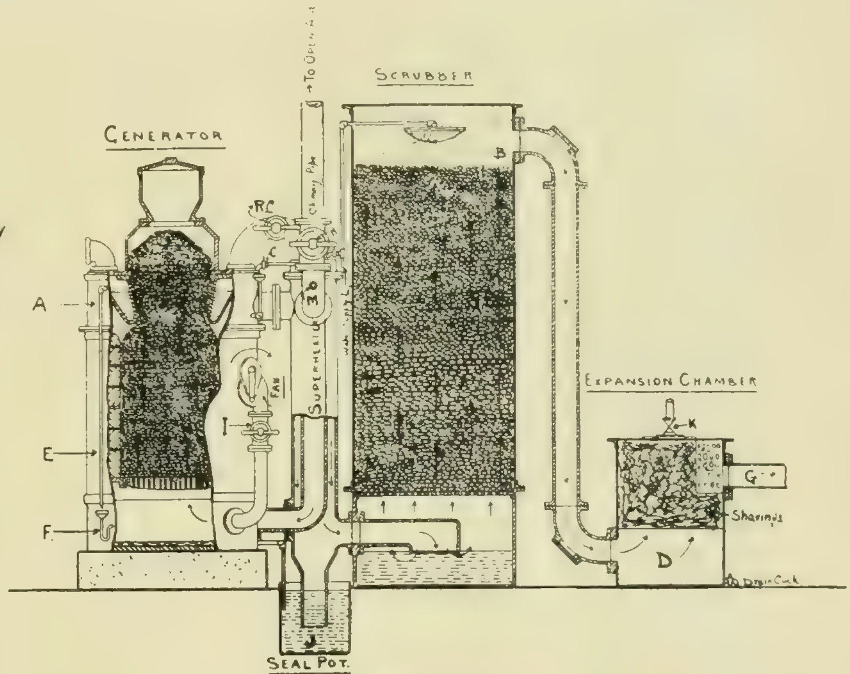


Fig. 4

connection with the Keighley gas engines. In this case the engine takes the place of the exhaust fan shown in Fig. 3, and sucks the gas through the pipe G, which causes a partial vacuum in the producer and air immediately rushes in at the elbow at top of producer, carrying with it a quantity of steam through the pipe leading to the ashpit under the grates. It will be noticed that this pipe leads down through the super-heater which conveys the hot gases from the generator to the scrubber, the object being to absorb as much of the waste heat as possible and return it in the form of hot air and steam to the generator. After passing through the coal the gases pass down the super-heater and enter the scrubber, as shown by the arrows.

The scrubber is simply a shell with a grating near the bottom to support the coke with which it is nearly filled. This coke is kept wet by a water sprinkler and as the gas must pass through this it is cooled and cleaned to a great extent. The expansion chamber acts as a supplementary cleaner. It is also fitted with a grate, to carry shavings or excelsior, the object being to catch any particles of dirt that may have come through the scrubber.

[3] When steam passes over red hot coals both Carbon Monoxide —CO, and Hydrogen—H, are formed. Both these gases are readily combustible in air, with the simultaneous production of great heat.

often driven by a small gasoline engine or a water motor. After the engine is started the only outlet to the atmosphere from the producer is through the exhaust pipe of the engine.

The operating field of gas producers may be said to be almost unlimited. They are now used extensively in steel works, ore roasting plants, chemical works, glass works, kilns, etc., where the gas is burned for heating purposes, resulting in a great saving in fuel. Many of them are designed to operate on wood blocks, wood chippings, sugar cane trash, peat (turf), etc., instead of on coal.

The fuels best adapted for suction gas producers, however, are anthracite or semi-anthracite pea coal, gas house coke (of small size), or charcoal.[4] With good anthracite the usual guarantee is that the coal consumption will not exceed one pound per h.p. hour at full load. In fact, actual tests have been made where the power was being used for generating electric current that showed the actual consumption of coal to be only 78 lbs. per hour for each 100 electrical h.p. measured at the switchboard, which, allowing a fair percentage for losses in the electric generator, would bring the coal consumption down to less than three quarters of a pound per B.h.p. hour at the engine.

[4] These all contain a high percentage of Carbon.

Montreal and the East

Important Electrical Agreement in Montreal.

An important circular has been issued by the Canadian Fire Underwriters' Association, which indicates that that body has become the sole authority on the Island of Montreal for electrical inspection. The circular, dated November 21, runs as follows:

''An agreement having been entered into, and signed, by the various electric lighting interests operating in Montreal and vicinity, whereby service connections for light or power will be made only on presentation of certificates from the electrical department of this Association.

''We wish to advise you that, on and after January 2nd, 1911, the above mentioned agreement will be in effect.

''Ample facilities for the prompt handling of inspections will be provided. Your hearty co-operation is solicited, with a view to making the work a success.''

The circular is signed by Mr. J. Bennett, chief electrical inspector of the Association, and a copy has been sent to all the architects, engineers and electrical contractors in Montreal.

In the past wiremen have been placed at a disadvantage owing to the confusion of authorities; the fire underwriters looking at installations from the point of view of fire risk, and the electric light companies from that of the life hazard. A uniform set of rulings must necessarily simplify matters. The following is the text of the agreement between the operating companies and the underwriters' Association:

''The installation of electrical apparatus, wires, conduits and all fittings and furnishings for electric lighting, heating or power in buildings, shall be executed in accordance with the rules and requirements of the electrical department of the Canadian Fire Underwriters' Association, which may be in force at the time the work is done. In every case before the commencement of the installation of any kind or class of electrical wiring or apparatus in buildings constructed or under construction, the owner shall furnish a receipt from the Canadian Fire Underwriters' Association, showing that an application for inspection has been made and accepted. No so-called concealed wiring for which a permit is issued or required shall be lathed over, or in any manner concealed from sight until inspected and accepted by the electrical department of the Canadian Fire Underwriters' Association, no electrical work, wiring or fixtures for which a permit is issued or required, shall be put to use or connected to service wires or any source of electrical energy, until inspected and accepted by the electrical department of the Canadian Fire Underwriters' Association, and a certificate issued thereon.''

Suburban Line Will Be Extended.

The extension of the Montreal & Southern Counties Railway, which carries residents of St. Lambert and Longueuil into Montreal each day to Chambly and Richelieu over the old line of the Central Vermont, is being rapidly completed and an announcement of the opening of the new branch will be made before long. The M. & S. C. has taken over the old Central Vermont line to these popular summer points on a long term lease and is now at work on the electrification of the road. The line is also seeking to extend its facilities in Montreal, and with this end in view has applied for permission from the M. S. R. to run its cars over the latter company's lines into Victoria Square. The M. & S. C. Company's charter with the city allows the running of the cars over the M. S. R.'s lines with the latter company's permission, and no difficulty is anticipated in the formation of an agreement which will end in the required permission being granted. Arrangements whereby the company will secure its electrical power from the Canadian, Light, Heat & Power Company's new plant at St. Timothee are also being completed.

Westmount's New By-Law.

The city of Westmount has drafted a new by-law which makes it necessary to file a certificate of inspection from the underwriters before a service of electric light or power can be made by any of the companies operating in the municipality.

It is expected that the town of Verdun will copy this by-law.

Sherbrook Railway and Power.

It is announced that construction work on the big new dam on the Magog river at Sherbrooke is at an end, and that the power house is entirely finished, with the exception of the installation of the generators, which will not be long delayed. The dam, which is composed entirely of concrete, is 300 feet long. The power development is located in the middle of the business district of Sherbrooke, and the dam is connected with the power house, which is situated below Commercial street, by a steel penstock 9½ feet in diameter, resting on reinforced concrete supports. It is anticipated that power will be turned on by January 1st at the latest.

Utilities Commission Imposes Fine.

Some time ago the Quebec Public Utilities Commission granted the Quebec County Railway the right to construct a line from Maple Ave, Quebec, to Sillery, with the attached provision that the rails be laid on the north side of the road. Apparently disregarding the order the company placed the rails on the south side. The commission summoned the company to appear before them and show cause why the order has been disobeyed. The company made a plea of good faith and ignorance of the actual meaning of the order, in consequence of which only the minimum fine of $200 was imposed. Furthermore, on the favorable report of the commission's engineer, the company was given the right to continue running on their rails on the south side.

Discovery of Tungsten in Nova Scotia.

A comparatively rare mineral, ''sheelite,'' has recently been discovered in Halifax County, Nova Scotia.

Sheelite is one of the minerals containing tungsten. It is of no known use in itself, excepting as an ore from which tungsten may be extracted. The mineral is chemically a tungstate of calcium. As an ingredient in the chemical side of steel making it is quite important. At present the world's annual output, coming mostly from Sweden, is placed at 4,000 tons. If present indications are correct, the recent discovery in Nova Scotia will not only yield sufficient for the steel plants in the province, but will have an effect on the markets of the world. The ore is reported to yield 60 per cent. of tungsten acid to the ton of sheelite. At present 25 men are at work on the preliminary experiments.

A Large Order for Motors.

The Nova Scotia Steel & Coal Company has recently placed an order with the Canadian General Electric Company for the following 250 volts, direct current, motors: Nine, 25 h.p.; two, 30 h.p.; two, 60 h.p.; four, 75 h.p.; two, 100 h.p., nineteen motors in all, aggregating 900 h.p., to be delivered early in the new year.

The Nova Scotia Telephone Company are installing a 50 drop central energy board at the office of the Nova Scotia Steel & Coal Company, equipped with storage battery plant, which will be charged from the electric power plant of the Steel Company.

Generating Plant at Aroostook Falls of the Maine and New Brunswick Power Company

Activity in Maritime Provinces

The Maine and New Brunswick Electric Power Company

There are three points on the international line separating Canada and the United States where our Governments have seen fit to allow the development and export of power for use in the latter country. These points are Fort Frances, where the Ontario & Minnesota Power Co. exports across the Rainy river

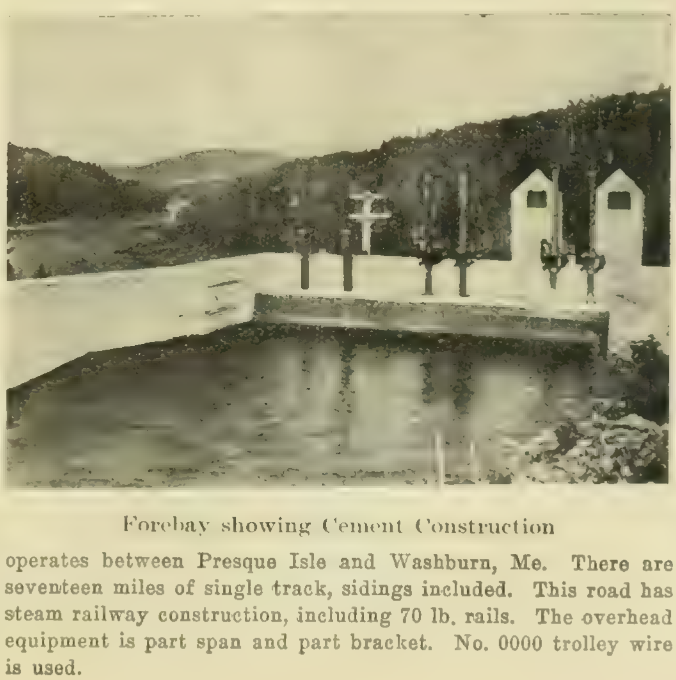
Power House at Aroostook Falls

to the town of International Falls, principally for use in various manufacturing industries controlled by the owner of the power plant, Mr. E. W. Bachus; Niagara Falls, where the Canadian Niagara Power Company, the Ontario Power Company, and the Electrical Development Company all export part of their output; and at Aroostook Falls, on the Aroostook river, a tributary of the St. John, situated just inside the international boundary line separating New Brunswick and the State of Maine.

The last Canadian Government report states that this latter company exported during the year ending March 31, 1910, a total of 1,169,642 kilowatt hours of electrical energy, and that 42,360 k.w.h. were used for Canadian consumption. The development is utilized chiefly to supply light and power to a number of United States towns and villages in the vicinity of Aroostook Falls and in operating an electric railway between a number of these towns, and which has been in operation since July 1, 1910. The Aroostook Falls are capable of developing about 6,000 horsepower. The developed head is 78 feet. The present installation consists of two pairs 21-inch Jenckes bronze turbines, 400 r.p.m. These operate two General Electric 500 k.w., 11,000 volt, 3 phase, 60 cycle generators.

Additional equipment is being installed at the present time. This consists of one pair 30-inch Jenckes turbines, 400 r.p.m., to operate a General Electric 1,500 k.w., 11,000 volt, 3 phase, 60 cycle generator.. There are about 75 miles of transmission line, the longest stretch being 50 miles, for which the current is stepped up at Fort Fairfield, Me., 5 miles from the plant, to 33,000 volts. Another line running to Presque Isle and Washburn, Me., transmits at generator pressure, 11,000 volts.

The electric railway, called the Aroostook Valley Railroad,



Forebay showing Cement Construction

operates between Presque Isle and Washburn, Me. There are seventeen miles of single track, sidings included. This road has steam railway construction, including 70 lb. rails. The overhead equipment is part span and part bracket. No. 0000 trolley wire is used.

A sub-station is located about half way along the line, containing transformers and rotary converters. The 60 cycle, 33,000 volt current is here converted into 1,200 volts, direct current, and distributed both ways along the trolley wire. No feeder wires are used. General Manager A. R. Gould states that the 1,200 d.c.

Bridge Construction on Aroostook Valley Railway

system is, in his opinion, the best invention ever introduced into electric railroad operation.

The rolling stock includes one heavy locomotive car equipped with four 75 h.p. motors, guaranteed to furnish 100 per cent. overload and capable of handling fifteen to twenty cars of freight; also a number of passenger cars equipped with four 50 h.p. motors, which handle seven or eight cars of freight.

The general manager of the system and the moving spirit in the construction of the electric road is Mr. A. R. Gould, of Presque Isle, Me. Mr. W. M. Jones is president.

Newfoundland to the Fore in Electrical Matters

The accompanying reproduction is a photograph of the exhibit of the electrical department of the Reid Newfoundland Company at the first industrial exhibition ever attempted in Newfoundland, and which was held in St. John's during the month of November. The arrangement of the exhibit reflects great credit on its designer, Mr. J. W. Morris, the chief electrician for the Reid Newfoundland Company.

The design of the booth, as shown in the illustration, was octagonal, with arched ribs, braced by two equally spaced circles, supporting a canopy; it was built of pine and finished in white enamel and gold. The panels were draped with cream silk and festooned with red roses, the circle in each panel having a transparency of the company's house flag.

Direct interior lighting was from 250 25-watt and 35-watt tungsten lamps in Holophane reflectors; 200 additional lamps were used for outline lighting; circles of colored lights and large tungstens on the dome were operated by a flasher.

The wiring was concealed and circuits were controlled from a flush type wall cabinet, which with meters and switches for lighting and heating circuits were fitted in the enclosed panel facing the entrance.

The company's flag flew to the breezes of a northeaster produced by a fan concealed in the main top, and for the special benefit of "the small boy" a miniature electric train, supplied with current from a small motor generator, kept up a continuous run around the larger of the two roof circles.

Heating and cooking appliances, vacuum cleaners, portable tools, etc., were shown in operation, and on the closing evening a special cooking demonstration under the supervision of the company's chef attracted large crowds; whether it was due to some electrical flavor not hitherto experienced by the guests or to the "juicy" nature of the cooking, the method is said to have been a great success, judging by the short space of time required for the cooks and waiters to dispose of a dozen turkeys and a large quantity of steaks and chops and a variety of vegetables.

As previously stated, this was practically the first attempt at getting together a representative exhibit of the colony's industries. All the local manufacturers' displays were exceptionally good and compared favorably with those at the provincial exhibitions in Canada.

From an industrial point of view Newfoundland has at present many disadvantages, but with the prospective development

Reid Newfoundland Co's Booth at St. John N.F. Exhibit

of mineral resources, pulp areas and farm lands, and the completion of railway extensions now under construction, the outlook is very promising for the future of the oldest colony.

Grand Falls Company Limited

Letters patent have been issued incorporating Sir W. C. Van Horne, Messrs. A. S. Holt, R. Proctor, G. F. Underwood, B. E. Kingman, J. Robinson and A. J. Gregory for the purpose among other things (1) of acquiring the water power at Grand Falls, Victoria County, Province of New Brunswick, (2) of constructing and operating a canal, and hydraulic race-way for power development, (3) of developing and distributing power, (4) of constructing, and operating mills and factories for manufacture of pulp and paper in all its branches, (5) of constructing and operating mills for carrying on the lumber business in all its branches, and (6) of erecting poles and wires to supply heat, light and power to various customers. The company is to be known as the "Grand Falls Company, Limited," and has a capital of $1,200,000. The head office will be the town of Grand Falls, N.B.

British Columbia and the West

New Lumber Mill Electrically Operated—Striking Example of Universal Application of Electric Power

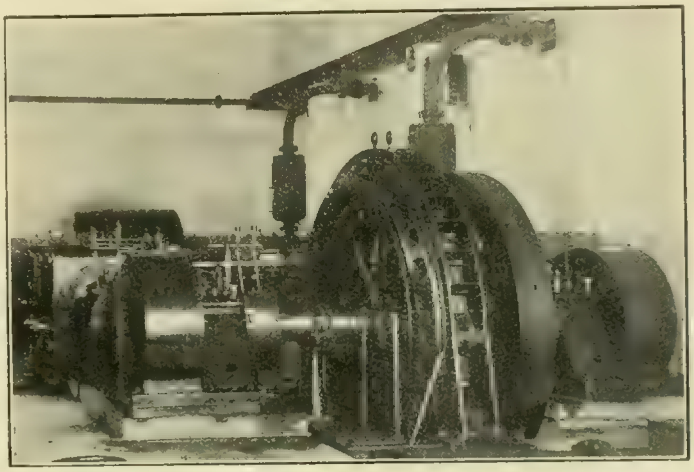
The application of electric power to sawmills, descriptions of which have appeared in the "Electrical News" from time to time, has added one more to its considerable list in the recent equipment of the North Pacific Lumber Company's new mill at Barnet, B.C.

The general arrangement is to drive the main part of the mill directly from one high speed Goldie Corliss engine of 1,000 h.p. capacity, the outlying groups being driven by induction motors, current for which is supplied by one 600 kilowatt, 3-phase, 60 cycle, 2,200-volt generator, direct connected to a second high speed compound Goldie Corliss engine. Both of the engines are equipped with steam operated dash pots on valve gear, and are run condensing. The speed of these engines is considerably higher than that of the ordinary Corliss engine, as the piston speed is 750 feet per minute.

In addition to the above equipment the engine room contains one 100 k.w., 125-volt direct current generator, direct connected to a high speed Ideal engine, which supplies the current used for lighting of the mill, yards, offices, etc., for motors used in the machine shop and filing rooms, for driving of power house ventilating fans, and for exciting the fields of the large alternator.

Owing to the scarcity of good feed water for the boilers, a surface condenser is used so that the water may be utilized over and over again. Economy of the fresh water supply is the keynote of this part of the equipment, all the pumps being made compound on the steam end and exhausting into the condenser. Sea water is used for cooling of the condenser, and is supplied by centrifugal pumps. The fire pumps, circulating and air pumps and condensers, are located in the basement of the power house.

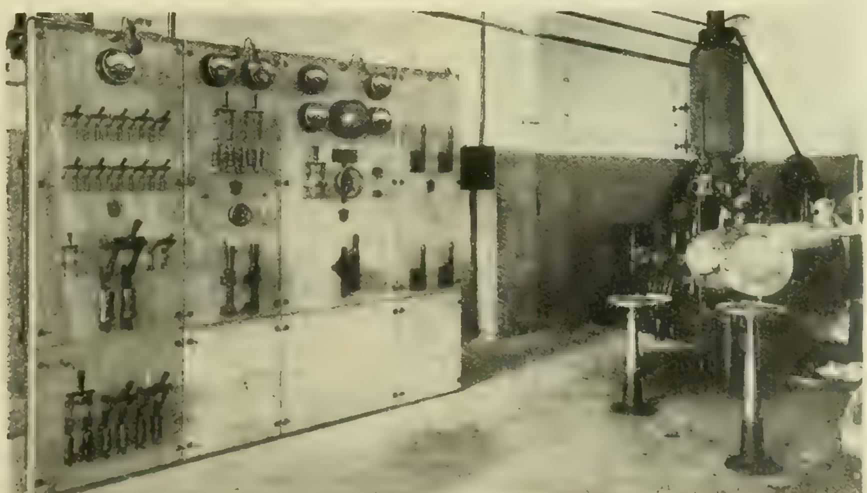
The hot well is constructed of reinforced concrete adjacent to the condenser. The total capacity of the boilers is 2,400 h.p., and fuel storage bins are provided above the boilers, the firing being done mechanically. The plant is provided with induced draft, thus eliminating a high smoke stack, the cost of maintenance of which has been found to be extremely high in this climate owing to the heavy rainfalls during the winter months. The furnaces are designed so that by using the induced draft the smoke and spark nuisance is done away with—so much so that under ordinary circumstances scarcely any smoke issues from the stack. The power house, together with the machine shop and boiler house, is of reinforced concrete, with iron roof. A noticeable feature is the minute attention that has been given to details tending to insure continuity of operation. In the event of fire in the mill or yard, the entire building can be completely enclosed, and air supplied to the operating staff by means of two electrically driven fans, whose intakes are located at the sea level, thus making sure that the fire pumps can be kept in operation.



600 kw. A. C. B. Generator, North Pacific Lumber Co.

The alternating current motors used are wound for 2,200 volts, this being the standard voltage on this coast for motors of 40 h.p. and larger, and the total capacity of these motors aggregates 999 h.p. Each motor is provided with a suitable control panel located conveniently to the motor. All these panels are enclosed in neat asbestos lined cabinets, with hinged doors on both sides to admit of ready access to the switch gear, etc.

Owing to the general excellence of the apparatus used it was felt that the work of installation and the materials employed should be of equally high standard. Consequently it was decided that the regulations of the National Board of Fire Underwriters should be observed to the letter. This decision rendered necessary the use of 3,500-volt lead covered cable, which was drawn



Switchboard and Exciter Set, North Pacific Lumber Company

in unlined steel conduits, and the end sealed with the most modern type of cable pot heads.

All the high voltage work in the power house is of the same quality, and the outside pole line distribution system is built according to the most modern practice. The wiring in the power house for light and for the small motors is enclosed in steel conduit with condulet fittings, making a neat and substantial arrangement. The lighting of each section of the mill, planer and sheds is controlled from an asbestos-lined cabinet. The wiring is run in conduits in all damp and exposed places. Thirty-two candlepower incandescent lamps are used throughout, and an excellent distribution of light is obtained. The extra expenditure for this equipment was found to be fully justified by the increased efficiency of the staff in working by artificial light. The lighting of the sorting platforms and yards is by arc lamps erected on poles of varying heights from the ground, according to the strength of illumination required.

Great care was taken during the installation of the equipment, and the entire electric system was put into operation without the slightest hitch. It is gratifying to note that the results obtained from the flexibility of this plant are considerably better than expected by the most sanguine exponents of electric power, and amply repay the lumber company for entering this almost unexplored field.

The designer of the mill is Mr. Robert Hamilton, of Vancouver, who personally supervised the entire installation. Messrs. Mather, Yuill & Company, of Vancouver, were the electrical engineers.

Nelson Street Railway

The city of Nelson has finally succeeded in rehabilitating their street railway system which has not been operated since the destruction of the rolling stock by fire some three years ago. Two fine new coaches are now operating and two more are on order. To raise the necessary funds it is understood that stock was issued in one dollar shares, and every citizen of Nelson boasts the proud possession of at least one share of street railway stock. Photographs of one of the new cars are given herewith.

The specifications of the cars are as follows: Type of body, semi-convertible; length of body, 30 feet 6 inches; length of

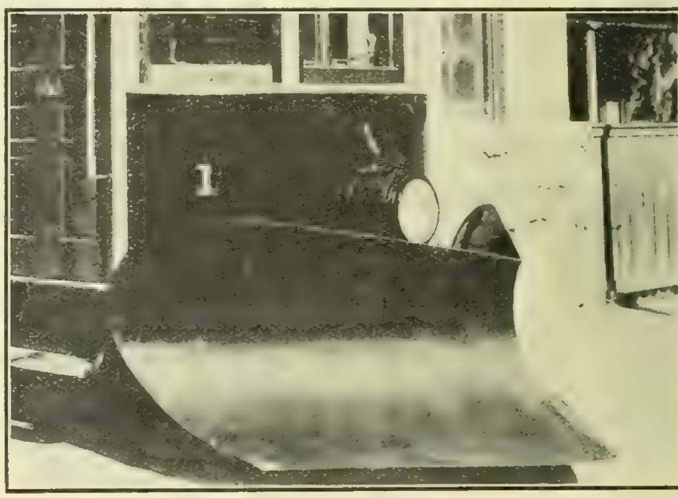
Nelson's New Street Cars—Mounted on Brill Trucks

vestibule, 5 feet; length over bunters, 41 feet 6 inches; width over side sheathing, 8 feet 6 inches; number of seats, 22; seating capacity, 44. Car bodies are mounted on Brill 27-G-T trucks and equipped with Allis-Chalmers type 301 motors, and standard hand brakes. They are fitted with rattan upholstered reversible seats, pantasote curtains, the Ottawa Car Company's non-jambing sanders, Providence fenders, Crouse-Hinds arc headlights, sterling fare registers, electric heaters, and all other minor fittings necessary for cars of this type. The interior finish, including window sashes and doors, is of red cherry. Fittings such as door locks, door hinges, window lifts, seat handles, etc., are of solid bronze, highly polished. An all-steel nose plow is supplied with these cars and is attachable to either of them, being capable of being put on or taken off in a very

Interior Nelson's New Coaches—Rattan Reversible Seat

few minutes. Although comparatively light, not requiring more than two men to handle it, this plow is of ample strength to clear the tracks after any ordinary snow storms.

These two coaches were built by the Ottawa Car Company,



Nelson's New Cars—An All Steel Plow

which now ranks as one of the big industrial concerns of the Capital, having built cars for many widely scattered cities of the Dominion. The high standard which this company has maintained gives assurance of a constantly increasing business.

Nelson, Dec. 6.—A report upon the operation of the street railway which was presented by Superintendent Ingram at a meeting of directors, showed that the gross receipts for the first seven days were $308.40, or an average of a trifle over $40 per day. As the actual cost of running one car is under $20, the directors are jubilant over this excellent showing which was made with one car, and only the old portion of the system in operation. J. E. Taylor, president, gave out a statement after the meeting to the effect that the old track had been thoroughly overhauled, and that the system was running in first class order. The present hourly schedule will be continued until the extension is opened and the wheels for the second car reach the city when an endeavor will be made to operate a 20-minute service.

The executive of the company have decided to put on a parcel carrying service and are now working out the details in connection with this innovation.

QUESTIONS AND ANSWERS

GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS:

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.
4. To avoid trouble and unnecessary delay, correspondents should state their questions clearly, so that there can be no possible doubt as to the information required.
5. In all cases the names of our correspondents will be treated confidentially.

Centrifugal vs. Turbine

Q.—What is the difference between a centrifugal and a turbine pump, and why is it that they are now being used to such a great extent.

A.—There is no inherent difference, the two terms being largely a matter of trade custom. As ordinarily applied, the term centrifugal pump covers the rotating type using centrifugal force as its basic principle, as opposed to the ordinary reciprocating or displacement pump. The former is limited to about 40 lbs. to 50 lbs. per impeller, or per stage, as it is more usually termed, so that if a pressure of 90 lbs. be needed, you will require a two-stage pump, three stages for 140 lbs., and so on. This combination of two or more stages, the water discharged from one passing on into the next, and so on, is called a turbine pump, though, as stated before, the term is largely conventional.

Their increased use of late years doubtless arises from improved methods of manufacture, making them both cheaper and also more efficient also, because they lend themselves so very readily to either direct or belt drive from electric motor. The increasing use of electric motors has thus doubtless tended to greatly popularize the turbine pump, especially when handling a steady flow of liquid, particularly if the quantity be large, as that is the especial field of this class of apparatus.

Recording Wattmeters on Three-phase Do Not Correspond.

Q.—We have a three-phase 440-volt motor, the power consumpmeters. One of them nearly always reads higher than the other, tion of which is measured by two single-phase recording wattsometimes much higher, notwithstanding that the voltages across the three phases are always identical, and that the motor takes just about the same current on all three-phases. We have also had the meters checked, but the company claim that they are all right. What is the explanation of our trouble?

A.—The reason for your apparent difficulty is that when two-single-phase meters, either indicating or integrating, are connected to a three-phase circuit on what is called the two wattmeter method, they read equally, even though the load be balanced, only when the power factor is unity. When the power factor is less than unity, one meter reads less than the other, the difference between the two increasing till at a power factor of 50 per cent, one instrument reads zero, and at still lower power factors it reads reversed. The explanation is that in the two wattmeter scheme of connection the potential coil of one element is connected to a phase which leads the current by 120 degrees, whereas in the other element it lags by a corresponding amount. Then, as the power factor varies, and the various angle in one element is different from that in the other, hence angle in one element is diferent from that in the other, hence the varying indications of the two meters. The fact that the relation between the readings differs from month to month is due simply to the fact that the power factor of the motor has varied during that period. This varying power factor has been caused by the varying power output demanded of the motor, hence it follows that as the power factor increases with increasing loads, the greater the total wattmeter readings the less the difference between the two meters, and vice versa.

Drying out Old Generator.

Q.—We have a direct-current, compound wound, generator, which has stood idle for a long period in an unused factory. What method may be adopted to insure its proper drying out and restoration?

A.—You may accomplish the drying out of your generator by short circuiting the armature through the series winding. The speed should be gradually increased from zero until full load current is obtained.

Shocks from Frames of Induction Motors.

Q.—We are experiencing a lot of trouble from our men getting shocks off the frames of some of our induction motors. We have examined the wiring carefully, and tested for grounds, etc., but can find nothing wrong. What do you think is the trouble, and what can be done about it?

A.—Your difficulty is apparently due to static trouble, either from the primary circuit or by being generated by the belts. It is not likely the former, unless you have a primary potential materially higher than the ordinary one of 2,300 volts. In either case, ground your motor frames to some good ground, such as the water system round your plant, also put a ground on your belts by means of a comb or brush of wires, this also thoroughly grounded at some convenient point. The points, four or five in number, made of copper wire, need not touch the belt, as a static charge will jump from belt to ground through an air gap of a quarter of an inch or so.

Twist in Rotor of Fan Motors.

Q.—Why are the bars in the rotor of an alternating current fan motor given a twist or skew, instead of being straight, as in nearly all other induction motors.

A.—The reason for the twist in the rotor of fan motors, and some other small induction motors, particularly single phase, is that motors of this type often have a tendency to come to rest in such a position that the stator and rotor have more or less of an interlock, and thus the motor may refuse to start when current is next thrown on. This interlocking is due to the magnetic reaction between the teeth of the stator and rotor iron, which in small motors must of necessity more or less approach each other in size and number. The twisting of the rotor obviously disturbs the symmetrical relations of the two. From the foregoing you will see that the objective point of the twisting is the iron, not the bars, and that the latter are twisted merely because they have to follow the slots.

Greater Heating at Low Power Factor.

Q.—What is the reason of the greater heating of a generator at low power factors than at unity power factor? I would think that the less power a machine gave out the less would be the heating.

A.—As the power factor of the load upon a generator is decreased the reactive effect of the current in the armature increases, this tending to weaken the field. This naturally means that more field current is required to keep the voltage up to any given point. This greater field current means, of course, greater heating, due to increased flux density and to increased copper losses.

The above is true even when the k.v.a., or apparent output of the generator, remains constant, that is, when the current and voltage are kept at their original values, irrespective of the change in the power factor. Obviously the heating will be much more marked if the k.w. output be kept constant, in which case the amperage of the machine will have to rise as the power factor falls from unity.

The foregoing applies only to lagging loads of low power fac-

tor. If the power factor be low, due to a leading load, the converse will be true. That is, the armature current tends to assist the field magnetism, consequently the field current can be dropped as the power factor lowers, and so a machine operating at a given k.v.a. or k.w. output runs cooler on a leading low power factor load than at unity.

Proper Feed to Two-Phase Motor.

Q. Should a two-phase motor be fed from two single-phase transformers, or would it be better to supply it with energy from a polyphase transformer?

A. The polyphase transformer is undoubtedly more compactly built and cheaper than the single-phase transformer. But it would be advisable to install two of the latter type, because of the greater applicability they lend to the simplification of the system. The single-phase transformer is adaptible to either it is usually possible to find another single-phase transformer, makes its installation advisable.

Mr. Monk's Water Power Bill

Mr. F. D. Monk, M.P. for Jacques Cartier, has already introduced his promised bill on water power conservation. It will be known as "The Water Powers Act." The Act first cites that "No water power, easement, servitude, right of user or usufruct upon or about any river, stream, rapid or water course belonging to or controlled by the Crown shall be alienated or in any way dealt with except as herein provided."

Such alienation shall be by lease only and for a period not exceeding 50 years.

When it has been decided by the Conservation Commission that any given water power may be used for industrial or other purposes full investigation shall be made by the Commission as to the power available, value, terms under which lease should be made, etc., etc. The intention to lease shall then be properly advertised, so that any interested parties may be given ample opportunity to submit tenders.

Failure to fulfil obligations, on the part of the lessee, is to be provided for in the agreement.

Provision is made for renewing the lease. A new appraisement is to be made of the value of the property, and in case the original lessee declines to accept the new terms offered by the Commission the privileges shall be offered at public auction, and the original lessee compensated to the extent of the sum received, at such auction, for the improvements to the property.

Yearly reports are to be made by the Government on the condition of the leased properties, payments, etc., and every possible assistance, such as maps, data, etc., rendered the Commission.

This Act to apply to all privileges already granted by the Government just as fully as if these regulations had been in force at the time the privileges were granted.

Ninth Wireless Station on British Columbia Coast

Work has been started upon the ninth Dominion government wireless station in British Columbia, which is to be located at Spencer's ranch, Dead Tree Point, near Skidegate, Q.C.I. A telephone line, which will connect the station with Skidegate, is in course of construction. It is expected that the new station will be working about the middle of November. During the present year the government has expended a large sum of money on the perfection of its wireless system along this coast and the service has been giving great satisfaction to the shipping fraternity. Only a few of the steamships entering these waters on regular schedule are not equipped with wireless, and for months past nearly all trans-Pacific liners have been reported two days before arrival. Three times a day the head station at Gonzales hill, Victoria receives from all other stations reports on weather and shipping; and it is safe to say that the shipping men of British Columbia are better served in this respect than those of any other maritime centre on the continent. Duplicate "Shoemaker" apparatus has been installed in all stations so that there is seldom a break in the continuity of the service. It is expected that the operators will work in shifts which will allow one man to be on duty every hour of the day and night.

Hon. Clifford Sifton on St. Lawrence Development

The Hon. Clifford Sifton, Chairman of the Conservation Commission, speaking before the Ottawa Canadian Club on the question of damming the St. Lawrence, said recently:

"I say no. There is no immediate demand for the development of power on the Canadian side. If they want power on the American side, let them develop American streams and water powers. When the question came up I said that so far as I was concerned the Commission would fight the idea of any private company putting a dam across the St. Lawrence River.

"The principle of public utility of revision of rates, and of resumption of the franchise in connection with all water power handed over by the public hereafter is pretty well implanted in the legislation in force at the present time. In three years' time it will be pretty fully made a part of the organic law of Canada.

"This means that those water powers that have not passed into the hands of private individuals will be controllable by the people. Therefore, it will never be the fact in the Dominion that the people will have to pay more excessive and unreasonable rates for their power."

A Western Waterway

The survey party engaged in enquiring into the feasibility of the construction of a waterway from Winnipeg to the Rockies by way of the Saskatchewan river, have returned. The survey has not been completed, but it is stated that it has been demonstrated that the waterway can be built without any insuperable difficulties. The nine-foot part of it from the head of Lake Winnipeg to La Pas would cost $3,000,000, and roughly speaking, the whole would entail an expenditure of $15,000,000. The revenue from the development of even 80,000 horsepower at Grand Falls, where, according to a recent estimate of the Hon. Wm. Ogilvie, 350,000 h.p. is available, would, it is estimated, be more than sufficient to pay interest on the total outlay. From La Pas westward, a five-foot waterway is proposed.

A New Rotary Engine

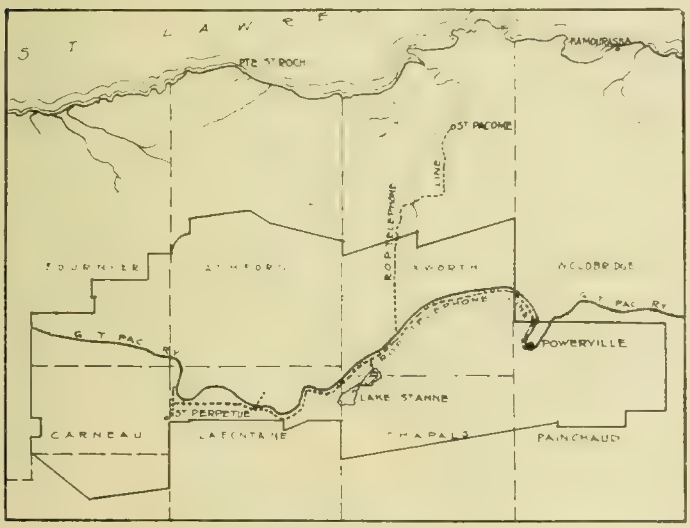
A Herrick balanced rotary engine, a recent development for the larger sizes, has just been subjected to continuous tests by Professor F. L. Pryor, of Stevens Institute. With 106 pounds steam pressure at the throttle, running 816 r.p.m. and exhausting into the atmosphere, this engine under test is said to have delivered 104.8 brake horse-power at 39.6 pounds of steam per brake horse-power per hour.

The C. P. R. subway at the head of the St. Lawrence Boulevard, Montreal, is now practically completed. The subway is 900 feet long, and at its deepest point dips 15 feet below the level of the street, it is 60 feet wide and in the excavation work, 20,000 cubic yards of earth and 7,000 cubic yards of stone were removed. On either side are 17½-foot sidewalks, leaving space in the middle for two car tracks and two traffic roadways. A nice finish is given to the work by a heavy concrete balastrade. This runs the whole length of the retaining walls, and is made of reinforced concrete. Altogether, in the walls and balastrade about 3,000 cubic yards of concrete were used. The bridge over the subway is built of steel and has an entirely fireproof roadway. It is 65 feet wide and 155 feet long and carries four tracks

Canadian Telephone News

Quebec

The River Ouelle Pulp & Lumber Company, Quebec, have just completed an extension to their Bush telephone line. The first line built, which has been in operation for over two years, runs for a distance of 9 to 10 miles east from Ste. Perpetue village, where it has a connection with the Kamouraska Telephone Company's wire. Owing to the convenience the line afforded, it was decided to extend the system; and during the past summer, a line was built from the office in St. Pacome, up through the 4th, 5th and 6th ranges of the parish of St. Pacome, where it crosses the River Ouelle into the 6th range of the parish of St. Oresime, whence it follows the Ste. Anne colonization road to the National Transcontinental Railway, a distance of approximately 17 miles, and then following the right of way for approximately 2½ miles to Lake Ste. Anne Camp, where there is an instrument, and where the company keep two guardians during the summer season. From there the line continues west for about 9 miles until it connects with the original installation at Ste. Perpetue. Then, from the Ste. Anne road, the line also runs east, following the National Transcontinental Railway right of way for a distance of 14½ miles, to the company's mill at Powerville, near the St. Phillippe road, where there are also two guardians during the summer season. The



Private Telephone System, River Quelle Lumber Company

total length of the system is approximately 52 miles, shown in outline in the accompanying sketch.

These lines were constructed mainly for protection in case of fires. There are telephones as follows: one at St. Pacome office and one in the manager's house, with a special night bell to enable fire rangers to get in connection with headquarters at any time, day or night; also a main telephone at the camp at Lake Ste. Anne, one in the company's office at Powerville, and one at the camp at Ste. Perpetue. The intention is to have connections for portable telephones at every half-mile along the National Transcontinental Railway, and every mile along colonization roads. The company have tested several portable telephones, but the only one that gave good service is considered rather too heavy for rangers to carry. It weighs 14 pounds and is in a waterproof case, carried strapped on the back. If they cannot get a portable instrument that will suit, they will install ordinary wall telephones every two miles along the National Transcontinental Railway.

The People's Telephone Co. has nearly completed its line from Sherbrooke to Stanstead and everything should be in readiness for operation by January 1. The material for the line was supplied by Messrs. Dawson & Company, Montreal, through Mr. C. G. Buck, one of the members of the firm, and it is said delivery was being filled in Sherbrooke three days after the order was placed.

An unusual feature of this system is that the line will be used by Mr. F. W. White, a stock broker of Sherbrooke, between the hours of 9 a.m. and 3.30 p.m. as a private line for business purposes, but will be available for public use at all other hours.

It is understood that the company contemplates the construction of a similar line to Coaticook.

Ontario

The Bell Telephone Company will make a change in the central office in Blenheim within the next few weeks, when they will move the central office into a building to be used exclusively for that purpose. A new switchboard will be put in and new cables. The office will be in charge of Mr. C. W. Halstead, of Ridgetown, who will also remain in charge of the office at Ridgetown, and will make his headquarters at that place. The Blenheim office has been in charge of Mr. H. W. Edmunds for the past four years, and during that time many changes and improvements have been made in the service. Four years ago there were only thirty-four phones on the Blenheim exchange, now there are 265. This great increase in the number of 'phones made a corresponding increase in the amount of business to be done at the central office, which has been handled by the company under Mr. Edmunds' management with splendid satisfaction to the local

The long-distance line which is being built by the Bell Telephone Company of Canada from Blind River eastward to Sudbury, and eventually to North Bay, has now reached Espanola, about 145 miles distant from the "Soo." The circuit—a number 12 copper—has been cut in east of Blind River at Cutler, Spanish, Massey, Webbwood and Espanola, and branch lines have been built connecting Algoma, Spragge and Walford. After a canvass for subscribers, exchanges are now being built at Massey and Webbwood. The 26 odd miles from North Bay westward to Cache Bay were built a year ago, so that the gap which it is now necessary to bridge in order to connect this whole territory and Sudbury with the general system of the Bell Telephone Company in Ontario and Quebec is about 95 miles.

The question of an increase of telephone rates, by the Bell Telephone Company, in Toronto which came up for consideration before the Railway and Municipal Board recently was decided against the company. Not only was permission refused to increase the general rate, but the company is ordered to give the newly annexed sections the same rate in future as the old sections have enjoyed in the past. This now means a general residence rate of $30 and a business rate of $50, beginning January 1, 1911.

New Brunswick

The New Brunswick Telephone Company have opened their new exchange at Stanley, which will be under the supervision of Manager Ebbett of the Fredericton exchange. Mr. Ebbett is at Stanley taking charge of the installation of the new exchange and employees are installing the 'phones for the 80 odd subscribers on the new exchange. Two operators will be employed at Stanley. By the inauguration of the Stanley service the New Brunswick Telephone Compay is fulfilling a long felt want in a progressive and prosperous section of New Brunswick.

A public investigation into the excessive rates charged by the New Brunswick Telephone Company, now seems assured. Definite steps in this direction were recently taken, when at a meeting of the Public Utilities Commissioners held in the Government offices, Church street, St. John, H. A. Powell, K.C., counsel for the board of trade committee, appointed to look into the matter, presented a formal complaint. The complaint is detailed and in addition to alleging that unreasonable charges have been made, also complains that the rates and tolls charged in this city are excessive in comparison with the rates, tolls and charges of the company for similar service in other parts of the province.

The New Brunswick Telephone Company has filed with the Public Utilities Commission an answer to the complaints made by a committee of the St. John Board of Trade. They deny that rates in St. John are unfairly high, on the ground that rates are based on the value of the whole provincial system, of which St. John gets the benefit. They also deny the company is over-capitalized, or that rates are higher than necessary to provide interest on investment, depreciation, renewals, etc. The company also disputes the jurisdiction of the Commission in telephone matters.

Western Canada

Extensive additions to the B. C. Telephone Company's exchanges at Nelson and Kamloops are announced to be made in the near future by Mr. Geo. H. Halse, general manager, who has just returned from a tour of the interior in connection with the company's business. Following the company's general policy of expansion, it is the intention to build new and permanent exchange buildings at both Nelson and Kamloops. A new rural line is to be constructed along the north shore of Kootenay lake, across from Nelson to the new town of Balfour. Another extension planned is to run the present line from Nelson to Slocan Junction, on up the Slocan valley to Slocan, a distance of 32 miles in all. In the Nelson exchange there are at present 530 lines in operation, which is pretty nearly the capacity of the office. But when the new exchange is completed the capacity of the exchange will be increased to 1,000 phones, with provision made for still further increases if the growth of the place demands it.

Boards of trade throughout the Kootenay are at present giving attention to the following resolution, submitted by the Associated Boards of Trade of Eastern British Columbia: "Resolved, that whereas the telephone is of such public utility that it should be owned and operated as a government and municipal undertaking, in order that it may serve the people as a whole and give to every person an opportunity of enjoying its advantages at cost, and, whereas, a considerable reduction could be made in the present charges for telephone service, especially if the service were to be furnished at cost to the subscriber, and; whereas, it is desirable that the government of British Columbia should construct long distance lines and have such lines duly operated, and, whereas, the local systems of telephones should be owned preferably by the municipalities; therefore resolved, that in the opinion of the board of trade, it is in the interests of the people of the Province of British Columbia that the government should enact legislation providing for the construction, acquisition, expropriation, maintenance and operation of a public telephone system or systems throughout the province, or in such districts as may be deemed advisable."

The Great Northern Railway has completed the installation of the new system of telephone connection between Gretna, Manitoba, and Grand Forks, Barnsville, Minnesota, and Devil's Lake, N.D. This system is installed for the purpose of train dispatching.

The local telephone company in Fernie, B.C., is rapidly extending its lines and within the next few days connection will be made with Bonner's Ferry, Sand Point, and other points in Idaho, also Spokane and Washington towns.

Trade Ad. Inquiries

1760. Molybdenite, wolfram, titanium, vanadium, spelter, etc.—A Scottish firm desires to purchase supplies of molybdenite, wolfram, titanium, vanadium, spelter, etc., and would like to hear from Canadian producers.

1772. Machinery.—Inquiries have been received through a commercial engineering bureau in Great Britain for the name of high-class firms in Canada open to handle the follows: (a) Electrical switchgear; (b) hydraulic and electric hand lifts, crabs, cranes and winches; (c) hydraulic and sanitary plant (pumps), etc.; (d) revolving shutters and collapsible gates; (e) air compressors and refrigerating machinery; (f) steam engines, oil and gas engines, boilers and boiler house accessories; (g) staircase and pavement lights; (h) street railway cars, railroad cars, trucks, cars and wagons of all descriptions.

New Books

Compendium of Applied Electricity, by Paul E. Lowe, M.E. —The David McKay Publishing Company, Philadelphia. A small book on electricity, its origin, nature and applications. Also dictionary of electrical terms and phrases. 214 illustrations. Price, 25 and 50 cents.

The Automatic Hand Books.—Revised and enlarged. By L. Elliot Brookes, Calvin F. Swingle, M.E., and other experts.—Frederic J. Drake & Company, Chicago, publishers; price, $2. An illustrated treatise of 700 pages dealing in a practical way with questions relating to the construction, care and operation of gasoline, electric and steam automobiles.

Steam Turbines.—By Rankin Kennedy; Whittaker & Company, London, publishers; price 4s. 6d. net. 62 illustrations.—A work designed for the use of engineers and students who desire to obtain an insight into the methods whereby the principal dimensions of steam turbines are calculated. Formulæ are given for calculating stages and numbers of wheels and dimensions with worked examples. The leading features of turbine construction are shown and fully illustrated.

Elementary Telegraphy.—By H. W. Pendry. Whittaker & Company, London, publishers. Price, 2s. 6d. net. 200 illustrations.—A text-book dealing with the introductory art and science of telegraphy. The most recent developments and practice of central battery working is described.

Conversations on Electricity.—By Joseph G. Branch, B.S., M.E. Rand, McNally & Company, Chicago and New York, publishers. Price, $2 postpaid. In this book it has been the author's object to deal with the subject of electricity in as clear and elementary a manner as possible, so as to familiarize the student with the principles of electricity. 96 illustrations.

Electric Wiring.—By Joseph G. Branch, B.S., M.E. Branch Publishing Company, Chicago, publishers. The author has made it his object to explain clearly the principles which govern the art of electric wiring, using only such wiring tables to demonstrate these principles, as are in daily practical use. Well illustrated.

The directors of the Saraguay Electric & Water Co. have authorized Mr. Charles Brandeis, civil and electrical engineer, 4 Phillips Place, Montreal, to proceed with the plans for their new power house machinery, etc., at an estimated cost of $225,000. Contracts will be placed on or about the 1st of February next. Steam turbines will be installed in units of 3,000 h.p. each. Plans and specifications can be seen at Mr. Brandeis' office at an early date.

Industrial Progress

Canadian Carbon Company Extending

It is gratifying to note the progress of this comparatively new Canadian enterprise which started but a few years ago on a small scale in Toronto and now finds the demand for its X Cell batteries so greatly increased that the plant in Toronto is not big enough to meet the requirements and a second large factory is being built in Winnipeg.

The business motto adopted by the Canadian Carbon Company, Limited, when first starting in business was "Quality First," and no pains were spared to live up, in every form, shape and manner, to the spirit of the trade mark of the company—the black cat with its proverbial nine lives. The success of the Canadian Carbon Company, Limited, has proven that batteries, just as well as any other article, can be manufactured in Canada, and when the Canadian Carbon Company are making their renowned X Cell battries, which last always Nine lives, not only for consumption in the Dominion, but are exporting them nearly all over the globe, at least to every country under the British flag, it is evident that Canadian goods have become keen competitors in fields which belonged before to Germany or the United States.

Having in mind the necessity of quick delivery as one of the main factors in distributing his goods, Mr. Alfred Landau, the president of the company, has associated himself with other gentlemen of high standing and ability in order to build another factory in Winnipeg, which is being fitted up at present with machinery and will be in operation by the 15th of January. The territorial division has been made so that all business east of Port Arthur will be handled by the factory in Toronto, while the territory west of Port Arthur will be served by the factory in Winnipeg. Mr. E. W. Hanna, late of Brandon, Man., has become the president and manager of the Winnipeg factory, and it is said of Mr. Hanna that he has never, so far, started anything without making a huge success of it.

Mr. T. D. Stewart, of the Canadian Stover Gasoline Engine Company, Limited, is the secretary of the Winnipeg company. Mr. Stewart joined forces with this company after he had had three years' experience in using and handling X Cell batteries, which fact the company points to as one of the greatest compliments that could be paid to the quality of their Canadian made Black Cat batteries.

The Toronto staff have also been further strengthened by the addition of Mr. Walter R. Winter, late of Gourlay, Winter & Leeming, the well-known piano manufacturers of Toronto. Mr. Winter, Jr., is vice-president of the Canadian Carbon Company, Limited, of Toronto; his specific duties will be supervision of the sales force of the company, so that Mr. Landau will be in a better position to give his undivided attention to the manufacturing departments of both factories.

Mr. Alfred Landau,
President Canadian Carbon Company, Toronto, Vice-President Canadian Carbon Company, Winnipeg

New Winnipeg Factory of the Canadian Carbon Company, Limited

Mr. W. R. Winter
Vice-President Canadian Carbon Co., Toronto

Mr. E. W. Hanna
President Canadian Carbon Co., Winnipeg

Mr. T. D. Stewart
Secretary Canadian Carbon Co., Winnipeg

In the last two months this company has taken up also the manufacture of Flashlight batteries as well as the making of all kinds of Flashlight cases of superior workmanship, and the best proof that there was a real demand in Canada for the manufacturing of these goods, which have developed from mere toys into necessities, is the fact that the factory in Toronto has to work overtime every day to keep up with the orders for these Flashlight goods.

The Canadian Carbon Company also holds the agency for the best miniature tungsten lamps made in Germany, and owing to the large quantities they import and to the preference prices they enjoy as agents, offer these miniature tungsten lamps at attractive prices. They also manufacture a line of pocket ammeters which are put out under the same trade mark as their X Cell batteries, the Black Cat with the words "Nine Lives" printed underneath. They are also agents for the well-known "Fabius Henrion" carbons, of Nancy, France, the largest carbon factory in the world. This factory in France is turning out 600,000 carbons each working day in the year and their facilities for making these carbons by automatic machinery are so great that, though of very high quality, they can be offered at a price much lower than any other carbons which have been marketed in Canada. The Canadian Carbon Company has also invaded the open arc lamp field, and most severe tests which were made on this type of carbons by the Peterboro Light & Power Company have resulted in placing contracts for such open arc lamp carbons. These carbons will be carried in stock in Montreal, Toronto and Winnipeg.

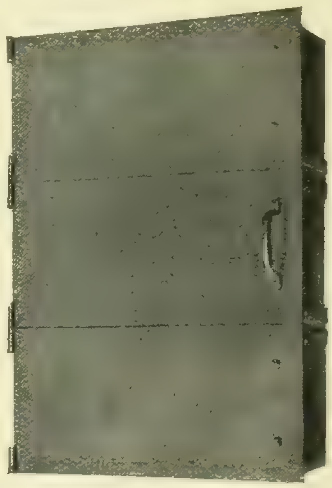
A New Sectional Cut-out Box

The Columbia Metal Box Company, New York, has just placed on the market a new sectional cutout box which they believe will be of great interest to the electrical trade.

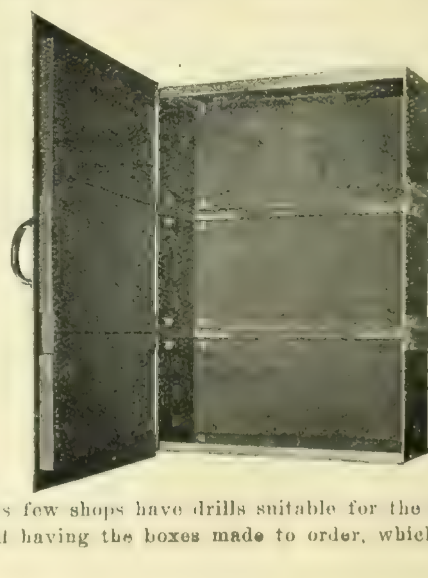
One of the many valuable features of this new box is the fact that universal cutout holders are supplied with every body section. These holders eliminate all drilling for cutouts and switches, which has been a source of great trouble and annoyance to contractors. This new box also contains knockouts for half-inch conduit evenly spaced on all sides.

It also frequently happens that boxes already installed must be enlarged. Formerly it was necessary to tear out and throw away the old box, substituting a new one of the required size, but where such a condition arises when this box is used it will only be necessary to remove a few screws and add one or more sections as the work may require.

The sectional principal has another advantage. It is often



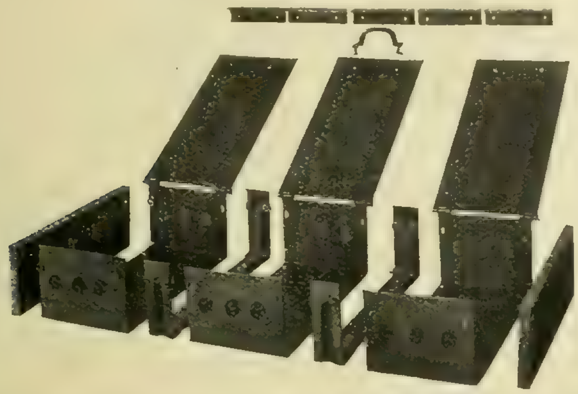
found necessary to use large conduits and the drilling of the holes has been very difficult to accomplish in boxes already



made up, as few shops have drills suitable for the work. This necessitated having the boxes made to order, which, of course,

added to the cost and delayed the work. With this box it is only necessary to take a section to the nearest drill press and have the holes drilled to suit in a few minutes, as the parts will easily slip under the smallest drill made. When assembled, which is accomplished by means of a few stove bolts, the boxes present a very substantial and neat appearance, lending a dignity to an installation not hitherto attained.

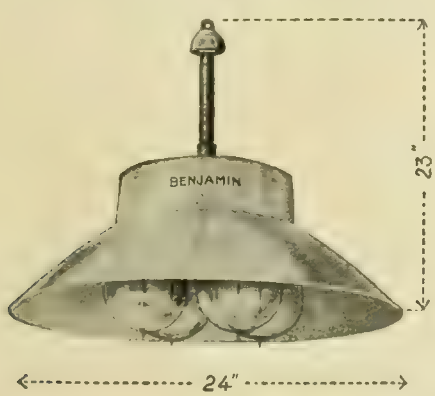
The unique but simple construction of this box is well illus-



trated by the cuts shown. It will be readily seen that the cover extends over the edges of the body of the box one-quarter of an inch, allowing the box to be used on the cheaper grade of work requiring flush boxes, as well as for surface work. The fact that the covers can be applied at any time permits the installation of the bodies when the roughing is being done, which is often necessary in some classes of work. In some cases wooden doors and trims are required, and in such instances the covers need not be used at all. The sections are stamped and drawn on heavy dies from sheet steel and absolute accuracy and uniformity are thereby assured. They are made in three widths, nine inches, twelve inches and sixteen inches, which experience has taught are the most practical sizes. The sections consist of a body section, cover section, end section and connecting strip section and cover connecting strip. All parts are interchangeable and are packed in heavy cardboard cartons, and as a great many sections can be packed in a very small space it enables a jobber or contractor to carry an unlimited assortment of sizes for a minimum investment of money and space. It is worthy of note that the above are approved by the underwriters.

The Benjamin Mill Cluster

The Benjamin Electric Company is just placing on the market a new line of electric fixture known as the mill cluster. Mill clusters are of two kinds. They are especially designed for the lighting of mills and factories. No. 0664½ has a 24 inch ena-



meled steel concentrating dome reflector and is intended for use where it is necessary to hand the lighting units sufficiently high to clear traveling cranes. No. 0684½ has a 24 inch enameled steel flat cone distributing reflector, for use where the units are suspended from 25 to 30 feet above the floor. Both fixtures have sockets for large base lamps, 8 inch stem for ½ inch iron pipe, and shock absorber. 250 watt large base lamps (S-40-B) are used. They are burned either in series on 220 volt circuits or series multiple on 110 volt circuits. These lamps have a short and rugged filament which is capable of withstanding ordinary jars and vibrations. The following results are claimed for the new service: (1) A superior quality of light; (2) 1,500 c. p. of reflected light as compared with aproximately 1,300 c. p. of a flaming arc; (3) a reduction of from 25 to 30 per cent. in operating expenses covering current, renewals and depreciation.

Radiant Electric Putting out New Stove

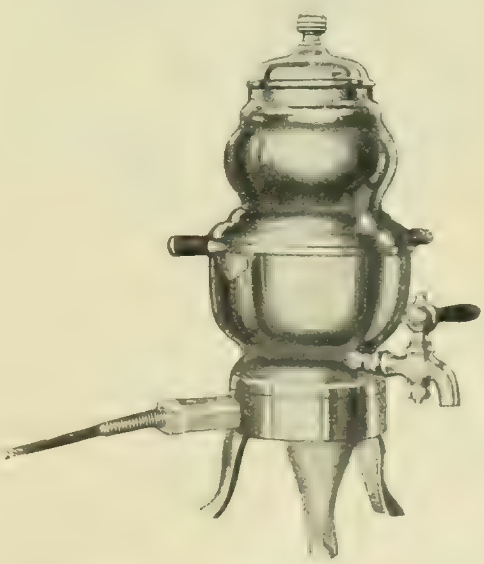
The Radiant Electric Company are placing on the market an innovation in the way of electric stoves. The special feature about this stove is the graded variation, by four degrees changes of the heat supply, the consumption ranging from 300 watts, the lowest, up to 1,200 watts, the highest. If a coil

should burn out it may be replaced without trouble in a few seconds at a cost of a few cents.

Owing to the steady increase in business which the Radiant Electric Company of Toronto have enjoyed since their organization in February of 1909, they are obliged to move to more commodious quarters at 168-174 King street west.

A Efficient Coffee Percolator

The National Electric Heating Company, of Galt, are now manufacturing a very efficient and handsomely finished coffee



New Percolator Manufactured in Galt

percolator, shown in the accompanying figure. It is made of spun copper heavily nickel plated.

From the high point of 1910 to the recent low level there has been a depreciation of $222,473,848 in the market value of 34 leading copper issues on the New York Stock Exchange.

The Quartzlite Lamp

In connection with the great advances in illumination which are taking place in the engineering world we feel that our readers will be interested in the description of a new lamp known as the Brush quartzlite lamp which has recently been introduced on the Canadian market. The construction of this lamp is most ingenious, the mechanism of it providing for the automatic coupling up of the mercury electrodes, which is momentarily necessary before the light can be a going concern. The burner consists of a vacuum tube of quartz, this material having, in fact, made the mercury lamp possible, as glass is not able to withstand the heat. At either end of the quartz tube are small tubes, which, containing mercury, serve as the negative and positive mercury electrodes. The tube is placed in a cradle, which on switching on the current tilts so that the mercury flows down, and the electrodes are momentarily

brought into contact, and as they separate an arc is formed which vaporizes a sufficient quantity of mercury to fill the vacuum tube and at the same time renders it incandescent. The result is a steady horizontal column of intense light, which is very rich in those chemically active rays of the sun known as the ultra-violet rays.

A maximum of intensity is reached after a few minutes' working. The lamp can be connected with the ordinary socket usually employed for receiving the incandescent filament lamp on a circuit of from 100 to 250 volts, but the light given by the mercury-quartz lamp on this circuit is from 1800 to 2500 c.p. This system provides a most economical and efficient method of lighting large open spaces, such as harbors, docks, shipyards, sidings, and goods yards, while it is suitable also for textile, printing and other factories and workshops in which the color of light is not so important as its quantity. These commercial applications are, of course, of great importance to determine what the influences on health may be of the particular kind of light produced by the discharge of electricity through attenuated mercury vapor.

On the face of it the effects should be in its favor, since to the ultra-violet rays of the sun are attributed the virtues of sunlight itself. They produce, for example, ozone, and the smell of ozone when the quartzlite lamp is burning is very obvious, and its presence is readily detected by chemical tests. It follows that the quartzlite lamp must have a favorable influence on the air, for organic impurities are readily destroyed by ozone. Then it is well known that ultra-violet rays are destructive to bacterial life, so that the quartzlite lamp is calculated to effect both a chemical and biological purification of the air in buildings where such purification is very often sorely needed. Of these purifying effects there is distinct evidence. The lamp imparts a curious and attractive freshness to the air of the room: there is a peculiar feeling of vitality about it characteristic of pure fresh air. Its oxidizing effects are shown by the rapid appearance of iodine in an acid solution of iodide, effects which are absolutely identical with those obtained when sunlight is applied to the same reagent. Acid solutions of quinine also exhibit a brilliant blue fluorescence in the rays, but the best demonstration of the richness in ultra-violet rays of the quartzlite is seen when a solution of fluorescein is brought into the neighborhood of the lamp. The impression the lamp gives is that of a room brilliantly lighted by moonlight, soft, cool and unirritating—the active part of the sun's radiations in unstinted quantity.

The richness of the lamp in ultra-violet rays, makes it of great importance to photographers and photo process workers. It is being used to a large extent in England for taking photographs at night time, and also is being largely used in making reproductions of drawings, etc. The actinic value of the rays renders this possible—a result not obtainable by any other class of lamp, to such a satisfactory extent.

Full particulars of this particular lamp can be obtained from the Canada Ford Company, 485 St. James street, Montreal, who are placing this light on the Canadian market.

Northern Electric are Exclusive Agents

The Safety Armorite Company, Pittsburg, Pa., have appointed the Northern Electric & Manufacturing Company, Limited, ex-
Jack Company), Mr. John Nagle (Thomas & Betts Company),
clusive agents in Canada for Sterling flexible conduit and conductor. This company will carry a stock at their different offices in Montreal, Toronto, Winnipeg, Regina, Calgary and Vancouver.

The first annual sales conference of the Montreal district house of the Northern Electric & Manufacturing Company was brought to a successful close by a banquet held at the St. Regis hotel on the 16th of December. The following members of the sales department were present: Messrs. T. R. Campbell, W. M. Tiffany, J. G. Bryson, M. Roeder, L. A. Johnson, C. T. Rappel, T. Farrell, J. J. Farrell, W. Murdoch, W. T. Forrester, G. F. Cowper, L. J. Papineau, H. D. Crouch, W. M. Turnley, P. M. Walker, H. L. Etienne.

Among the guests present were: Mr. P. F. Sise, Mr. E. C. Peterson, Mr. E. H. McLea, Mr. R. Edwards, Jr., Mr. G. L. MacGillvray, Mr. E. G. Mack (Crouse-Hinds Company), Mr. N. S. Braden (Canadian Westinghouse Company), Mr. Henderson (Canadian Westinghouse Company), Mr. W. B. Hendry (Watson
Mr. F. A. Morny (Columbia Metal Box Company), Mr. A. F. Crosby (American Cross-Arm Company), Mr. D. H. Ross (Alfred Collyer & Company), Mr. T. H. Bibber (Edwards & Company), Mr. Boyd (Montreal Rolling Mills), Mr. E. F. Sise (Wire & Cable Company), Mr. C. F. R. Jones (Wire & Cable Company), Mr. A. Landau (Canadian Carbon Company), Mr. E. E. Gauche (Beck Flaming Lamp Company), Mr. C. Duncan (Duncan Electrical Company), Mr. James Bennett (Canadian Fire Underwriters' Association).

Le Valley Vitae Carbon Brush

The Electrical Maintenance & Repairs Company, Toronto, are now handling the celebrated Le Valley Vitae carbon brush for motors and dynamos, for which they claim many points of superiority over any other brush on the market. With the very highest grade of carbon procurable under the most scientific processes, is compressed a lubricant of very low resistance and of such a nature that it prevents excessive wear of commutator, giving a high conductivity and running cool and noiseless. The resistance of the brush lengthwise and across the width is low, but through its thickness is comparatively high. This has the effect of eliminating the sparking of the bars under short circuit by the brush. The manufacturers are careful to give the commutator that smooth, glossy, hard, bronze finish so desired by all experienced engineers, which is practically indestructible when once acquired. A full stock of this brush is carried by the above firm in sheets of different thicknesses, from which brushes are cut to order.

One Month's Good Record

The Hinton Electric Co., who have large establishments in both Vancouver and Victoria, were appointed less than a month ago to represent the Canadian Tungsten Lamp Company in British Columbia. The first order received at the Hamilton factory, and which has just gone forward, consisted of 12,750 "Kolloid-Wolframs" and 20,000 "Brilliants."

Mr. A. L. Woolf, the Canadian Tungsten Lamp Co.'s special Western representative, is spending the Christmas holidays in New Lork. Mr. W. Fitzgerald Kelly is in charge of the Canadian Tungsten Lamp Co.'s exhibit in London.

The Canadian Tungsten Lamp Co. are supplying all the Hydro-Electric stations that are at present in operation, they having supplied the "Kolloid-Wolfram" lamp to the Toronto, Guelph, Niagara, Preston, Dundas, Berlin and Woodstock stations. The London Hydro Commissioners have also accepted the Canadian Tungsten Lamp Company's tender, as have also the Toronto Hydro-Electric, for a supply for local distribution in London and Toronto.

Two Gas Engine Electric Plants

The Fairclough Art Glass and Decorating Company, Toronto, have recently placed an order for a Lancashire dynamo for lighting and power purposes. This generator will be driven by a Keighley gas engine supplied by the H. W. Petrie Company, Limited. The same company is also supplying the Consumers' Gas Company, Toronto, with a Keighley gas engine to operate a 40 h.p. Lancashire generator for lighting purposes only. In both these instances the gas engine will be operated by gas supplied from the city mains.

Moving to New Offices

The Canada Ford Company announce that owing to pressure of space, they have removed from their offices in the Canadian Express Building, and will hereafter occupy the entire building at 485 St. James street (a few doors west of Inspector), Montreal, where they will carry a complete line of the products of the Brush Electrical Engineering Company, Limited, of Loughborough, England, as well as ventilating fans and blowers, and will consequently be able to supply from stock everything required for complete electric plant.

The "D. P." Battery Company, Limited, is apparently participating freely in the increased exports, having been very successful in their over-sea trade during the past month. Amongst other shipments, batteries have been forwarded to the Transvaal (two), India, Siam, Queensland, Newfoundland, and Canada. The home trade is also reported very firm.

Silver Medal and Grand Prize

Jones & Glassco, engineers, Montreal, Canadian agents for Reginald Driving Chains, have been awarded the silver medal (highest award) for their exhibit of transmission machinery at the recent Canadian National Exhibition in Toronto. Their principals, Messrs. Hans Regynold, of Manchester, England, were also awarded the grand prize at the Brussels Exposition, 1910.

Sidney Electric Power Company.

Trade Publications

Allis-Chalmers Belted Corliss Engines.—Bulletin No. 1501, fully descriptive of their "Reliance" pattern engine with details of its various parts.

Dossert Solderless Connectors.—Catalogue No. 5, illustrating the different types, and the use for which each connector is intended. Dimensions of all standard connectors are given.

The McGill Manufacturing Company, Valparaiso, Indiana, have just issued their 1910-11 catalogue, dealing, among other things, with their well known Loxon and Crescent lamp guards, portables and soldering specialties.. This is by far the most attractive book this company has every put out.

Ad Book No. 22, just issued by the Westinghouse Electric & Manufacturing Company, contains a series of attractive advertisements suited to the use of central station companies that are anxious to boom their Christmas and New Year trade in electrical appliances.

The Elmer P. Morris Company, 90 West street, New York City, the "Outdoor Lighting Specialty House," have recently issued an artistic catalogue, No. 19, covering street lighting brackets, in which many attractive designs are illustrated. The latest specialty brought out by this company, known as the "On the Level" central suspension fixture, is designed so the lamp, reflector and canopy hang from swing joint below the break arm, and the reflector is always "On the Level" even though a strain upon the leading-in wires may pull the break arm and insulator out of alignment.

Switchboard Indicating Meters.—Circular No. 1098 issued by the Canadian Westinghouse Company, descriptive of the various types of meters, synchroscopes and instrument transformers manufactured by this company.

High Efficiency Lamps.—Bulletin 9B, issued by the National Electric Lamp Association. Reprint of a paper by S. E. Doane, with comments thereon. Also a bulletin outlining the engineering and scientific activities of this Association.

Escher, Wyss & Company, Zurich and Ravensburg, have just issued four well illustrated, interesting descriptive catalogues. (1) Zoelly marine turbines; (2) Zoelly turbo-compressors; (3) Francis water turbines, enclosed construction; (4) Francis water turbines, open construction.

Slip-ring Induction Motors.—Circular No. 1188, by Westinghouse Company of Pittsburg. The circular describes a line of alternating current slip-ring motors designed especially for cranes, hoists and elevators. Reference is made also to suitable controlling devices and brakes.

Panels and Cabinets.—Bulletin No. 1, by the Crouse-Hinds Company, Syracuse, N.Y. A very attractive 9 by 12-inch, 80 page catalogue, devoted to panel boards and cabinets, illustrated in two colors and printed on heavy coated white paper. Each detail of construction is briefly described and prices of both individual and assembled parts given.

C. W. Bongard Company.—Manufacturers of electrical supplies, Toronto. Catalogue No. 3, giving detailed descriptions with illustrations and prices, of their very complete stock of electrical supplies.

Reco Flashers.—For electric signs and displays of every description. Bulletin issued by the Reynolds Electric Flasher Manufacturing Company, Chicago and New York. Well illustrated and containing many items of interest.

Current News and Notes

Bowmanville, Ont.

A by-law will be voted upon on Dec. 27 on the granting of a franchise to the Seymour Power & Electric Company, Limited, to enter the limits of the corporation with poles, lines, plant and machinery, etc.

Brandon, Man.

Several petitions are in circulation here asking the council to grant a franchise for the street railway to a Vancouver syndicate, which offers to build at once

Brockville, Ont.

The council will submit a by-law asking that the separate departments - water and light—be operated in future under one commission.

Brighton, Ont.

The Electric Power Company, through the Seymour Power & Electric Company, expect to be delivering power here by Feb. 1.

Barrie, Ont.

An engineer of the Hydro-Electric Comsion will visit Barrie with a view to laying before the town figures for power developed at the Big Chute, Severn river. Midland and Penetang will also be visited.

Berlin, Ont.

An application will be made to Parliament for an act to incorporate a railway company under the name of the Imperial Traction Company with power to lay out and operate from Hamilton to Guelph, Berlin, Stratford, St. Marys, London, Ingersoll, Woodstock, Brantford, Hamilton, with extensions.

The council approved of the action of the Water and Light Commission in regard to the $40,000 to be raised by by-law in January. $10,000 of this will be spent on new lights.

All electric wiring in new houses, business blocks, factories, etc., must be installed according to the Underwriters' Association rules, and must be inspected by either the Commission's or the Underwriter's inspectors before connections will be made with the plant. A charge of $1 will be made for the first inspection and 50 cents for each subsequent inspection.

The light committee have fixed the rate for residential lighting by Hydro-Electric power. There will be a fixed charge per 100 square feet of the area lighted, of 5 cents per month, and in addition a charge per kilowatt hour of 4 cents. This is subject to a discount of 10 per cent. if paid in a month, and to a further discount of 10 per cent. if paid in 10 days. The reduction from present rate is estimated at about 7½ per cent., or in other words, the present rate will be about 9½ cents per kilowatt hour.

Charlottetown, P.E.I.

Monday, Nov. 21, was the 58th anniversary of the laying of the first ocean cable in America, that between Prince Edward Island and New Brunswick.

Chilliwack, B.C.

The recent annual meeting of the Chilliwack Telephone Company revealed a healthy condition in the company's finances to the extent of a dividend of 10 p.c. being declared. In his address President Gervan spoke of the satisfaction it gave the directors to be able to report so favorable a state of affairs, and recited some of the extensions carried out during the past year. At present almost the whole Chilliwack valley was served by their system. Another important development was an arrangement entered into with the B. C. Telephone Company, whereby for the sum of $60 per month they agreed to operate that company's long distance business over any of their lines.

The Chilliwack Telephone Company, Limited, will raise the capital stock of the company from $20,000 to $50,000, and the additional $30,000 will be offered to the present shareholders at the original par value of the shares, i.e., $10 a share. This year a ten per cent. dividend is to be paid to all holders of paid up stock, and a reserve fund of $2,500 was put aside for emergencies. According to the financial statement a net profit of $5,208.57 was shown in the year's workings.

Coaticook, Ont.

The corporation now has its new electric plant installed and the council is having a demand for more power from citizens of the town. Already three users of power in the municipality who formerly used either gasoline or steam engines are now putting in motors and will use electricity.

Camrose, B.C.

The 125 k.w. generator for the power plant will be shipped between the 15th or 20th of December. The 80-foot smoke stack, weighing 3,500 pounds, is being erected this week. A shipment of 150 meters has also been received ready for installation as soon as required. The main line work is practically completed this week. There are still several transformers to be hung, street lights to be erected and meters to be installed in residences and business places.

Calgary, Alta.

The city is installing a new street lighting system along its main thoroughfares. Magnetite arc lamps are being used.

This city is installing a 1,500 h.p. synchronous motor generator, a motor generator enciter set, and the necessary switchboard apparatus.

A further extension of the natural gas business in the city, possibly to the extent of piping in gas from Gleichen and other points east of here, where wells are being drilled, was planned at the annual meeting of the Calgary Natural Gas Company.

The order for a dozen new street cars has been given to the Preston Car & Coach Company, eight to be delivered by June 1, 1911, and the remainder by Aug. 1. The tender of the Taylor firm, also of Preston, for single trucks was also accepted. The tenders for the latter were: Curtis single truck, $390 each; Brill, $370; Taylor, $363.

This municipality has under consideration large extensions to the electric light and power departments, for which estimates will be prepared and a by-law submitted as early as possible in the new year.

The tender for supply of about 1,045 tons of steel rails was divided between J. W. Campbell, of this city, and Gorman, Clancy & Grindley, both representing American firms. Total price, $105,000; that for A.S.C.E. rail used in suburban lines, $52.11 for No. 1 grade; for No. 1, Lorraine, $56.54.

Deseronto, Ont.

A by-law will be voted on at the municipal elections to authorize and confirm certain agreements between the Trenton Electric & Water Company, Limited, and this town.

Edmonton, Alta.

The annual report of City Auditor Richardson on the financial status of the various municipally operated utilities shows an increased street railway deficit over last year, but a considerable surplus in the electric light and power department.

Eardley, Que.

The Wright & Pontiac Telephone Company, composed of residents of Eardley, Que., which obtained its charter from the provincial government last June, to construct a telephone system in the counties of Wright and Pontiac, have almost completed the construction of the system between Aylmer, Eardley and Quyon, and expect to have the service in operation by New Years. Arrangements have been made whereby long distance connections can be effected with the Bell Telephone Company. The inauguration of the service will prove a great boon to those residing in the district, and telephones have been installed in nearly every residence. Notary Lacoursier, of Maniwaki, has also constructed a telephone service between that point and Riviere Joseph, a distance of eight miles.

Fredericton, N.B.

There is talk of establishing a new electric light power plant in this city and later the construction of a street railway.

Fort William, Ont.

This city will vote on a by-law asking permission to expend $25,000 on telephone extensions, and $67,000 on street railway extensions.

There is an increasing demand for power in this city, and, in all probability, the Kaministiquia Power Company will need to further extend its plant.

By-laws will be submitted at New Year authorizing expenditures as follows: Telephones, $24,590; electric lighting, $20,000; street railway, $90,000. A by-law for the regulation of electrical installations is also recommended as follows: "No person, firm or corporation shall install wires or other apparatus for the use of electric currents for illumination, decoration, power or heating, or do any electrical construction work of any kind whatever, either the installing of a new electrical apparatus or repairing or altering or adding to any wiring or apparatus already installed, or shall sell apparatus which shall consume electric current, except they shall have obtained a license."

Galt, Ont.

It is expected Niagara power will be turned on about Jan. 1st.

Guelph, Ont.

The amounts to be voted on by the various townships and towns in connection with People's Railway are as follows: Proton township, $36,000; Luther township, $30,000; Garafraxa township, $25,000; Arthur, $20,000; Fergus, $20,000, and Elora, $15,000. Total, $146,000.

Hespeler, Ont.

A by-law will be voted on at the municipal elections to provide for the issue of

$4,000 debentures required to provide for the local distribution of electric power, and for extension of the electric light system of the town of Hespeler.

The Radial Railway Board have decided to ask the council to prepare and submit a by-law to raise the sum of $30,000 to provide for the extension of the Radial Railway into St. Patrick's Ward.

This city will vote on a by-law asking to issue debentures to the amount of $30,000 for extension and betterment of the Guelph Radial Railway system.

Niagara power was turned on Nov. 23. It is suggested that the arc system of street lighting be replaced by incandescents.

Ingersoll, Ont.

The ratepayers will vote at the January elections on the question of the control of the electric lighting system by a commission.

Official notices have been sent out from the town clerk's office to users of electric power intimating that Hydro-Electric power is expected to be available here about Jan. 15 next, and that it will be necessary for them to change their motors d.c. to alternating.

Kenora, Ont.

A largely signed petition has been presented to the town council asking that the electric lights in store windows be placed on a flat rate in place of meter, as at present. It was pointed out that the business streets at night have a decidedly dark appearance on account of the natural desire of the merchants to economize on their light bills, and the use of the meter is blamed. The council met the suggestion with considerable favor, but decided to refer the petition to Manager Thomas for an estimate of the probable cost of any changes the town might have to make.

Kingston, Ont.

The Light, Heat & Power Committee's recommendation for the raising by debentures of $13,000 by vote of the people for street lighting passed council.

Listowel, Ont.

On Jan. 2nd a by-law will be voted on to issue $5,000, 4½ per cent. electric light debentures. William Bright, clerk.

London, Ont.

The city's streets were illuminated with Niagara power for the first time on Nov. 30th.

The city rates for street lighting will not be reduced for the present, at least, the cost to the city remaining the asme as under the agreement with the London Electric Co.

It is very probable a merging of interests of the London Street Railway. The London Electric Company and the London & Lake Erie Traction Company will follow the city's refusal to buy out the Electric Company. New generating capacity would be installed by the latter company to supply the railways with power.

At the recent session of the county court a jury refused to assess the Stratford Bridge and Iron Works for damages in the case of George Rawlings, the laborer who was injured while employed by that company on the hydro-electric station east of the city. Rawlings was working beneath a scaffold, when a number of tools fell upon him from a height of 26 feet, breaking his ribs, lacerating his scalp, and rendering him unconscious.

Chief Electrical Engineer Van Cleve has instructed the London Street Railway Company to distinguish the various street cars by colored lights. It is propable that the street railway company will make the change suggested without serious objection.

The directors of the London Electric Company refused to accept the city's offer of $100,000 for their plant. The lowest price the company will consider is $175,000. A resolution was passed, to the effect that it would be the policy of the company to carry on the business vigorously. The directors include Mr. W. D. Matthews, president, and Messrs. H. P. Dwight, Robert Jaffray, Hon. J. K. Kerr, W. R. Brock, of Toronto; also Messrs. Kent and Hunt of London.

The 60 watt lamps at first installed on the city streets do not give sufficient illumination and 100 watt units will probably be used. The lamps are as far apart as 500 feet on certain streets.

The Hydro-Electric repair shops will be built in this city, and in connection with the building there will be a big garage for storing the automobiles of the commission's inspectors, as well as a department for these officers.

The London Electric Company has issued a statement to the effect that the rate for lighting will be reduced to five cents a kilowatt, with a discount of 10 per cent., or 4½ cents per kilowatt flat. If this does not meet the city rate a further reduction will be made.

The ratepayers may be asked to adopt a policy of electrical radial railway development. Two proposals are before the council. The promoters of the London & Northwestern Railway ask the city to guarantee their bonds to the extent of $150,000 as an aid to the construction of a road from Sarnia to London, via Forest and Arkona. The promoters of the North Midland Company ask for aid on a similar plan to the extent of $200,000 for a road from Stratford into London, via Lucan and St. Marys. A third line is talked of from Ingersoll to London, but so far no application in its behalf has been made.

Marmora, Ont.

A by-law authorizing the village to purchase the Marmora Electric Light Company's plant has been carried by a large majority.

Mitchell, Ont.

The Hydro-Electric Power by-law was carried.

It is stated that work on the Hydro-Electric Commission's transmission line between Stratford and Mitchell will soon be commenced and will be rushed along as fast as possible. Engineer Yates has been in consultation with Town Engineer Ord and it is said comparatively few changes to the old system will be necessary.

Melfort, Sask.

On Dec. 27th a by-law will be voted on to issue $4,000, 5 per cent. debentures for the purchase of certain lands and $3,000, 5 per cent., 20 year, telephone debentures.

Ald. Dubeau has suggested special street cars for ladies during the rush hours.

Mr. Parent, superintendent of the city lighting department, states that after Dec. 31, all the gas lights in the city streets will be removed. These lights are now out of date, and he proposes to replace them by incandescent tungsten electric lamps, with twice the power, and costing less. In certain districts, however, the gas lights will be replaced by electric arcs.

Ex-Mayor James Allen, of Verdun, has been awarded $5,500 and costs against the Montreal Street Railway Company. Mr. Allen, some time after undergoing an operation, from which he had almost recovered, became involved in a head-on collision between two cars, with results which, he claimed, permanently injured his health.

Mr. Justice Greenshields recently heard a damage action brought against the city and the Montreal Light, Heat and Power Company by Mrs. E. St. Amour for $1,855 damages for an accident which occurred to her while driving. The cause of the accident was improperly lighted openings in the street, made by the Montreal Light, Heat and Power Co. Judgment was given for the plaintiff, both the city and the Light, Heat and Power Company being held responsible.

President Robert, of the Montreal Street Railway, is quoted as saying that there is no use building an underground railway in a city of less than a million people, and that the M.S.R. has no present intention of relieving Montreal's congestion in that way.

The Dominion Marine Association, which is made up of representatives of inland navigation, wrote recently to the council of the Board of Trade stating that the Canadian Light & Power Company were seeking authority from the Federal Government to divert more water from the Cedar rapids. If this permission were granted the association submitted that it would have the effect of lowering the water levels of Lake St. Francis and the upper end of the Soulanges Canal. Therefore the council was asked to support the association in its protest to the Government against the company's request being granted. The council expressed disapproval of any scheme which would lower the water level of either the St. Lawrence or its canal system at any point, and the secretary was instructed to write to the Government to this effect.

Medicine Hat, Alta.

Work on the proposed power plant is now under construction by day labor; cost about $50,000. A. Grimmer, city engineer.

Another great gas gusher has been successfully tapped on the Hargrave property in this city. The depth is 1,042 feet, and the yield 3,000,000 feet per day. The C.P.R. will experiment in the transportation of natural gas from Medicine Hat to points further west, and to this end has had two special cars made in Germany, each equipped with 36 cylinders, which are 15 feet by 8 inches in size. Trains now running west of Medicine Hat have been using the gas as an illuminant for some time.

Nanaimo, B.C.

A by-law is being prepared authorizing the Nanaimo General Electric Railway Co. to build an electric railway over certain streets in Nanaimo, B.C.

Niagara Falls, Ont.

W. D'Arcy Ryan, electrical expert, has submitted his report re Cataract illumination, in which he estimates the cost of installing an elaborate plant at $70,000; 700 h.p. would be needed.

The Queen Victoria Park Commission recently gave a hearing in the city hall to the Board of Trade's application to have the International Railway charge a five-cent cash fare within the city limits, instead of the present ten-cent rate. Mr. Griffiths, representing the Board of Trade, declared that under the present arrangement, whereby tourists were charged more

than citizens, visitors to the city suffered a real imposition. Citizens' tickets are sold at five cents each, but the Board of Trade wants the cash fare cut to 5 cents. The railway answered that it could not afford to cut the cash fare to five cents, because the road makes money only a few months each year during the summer tourist rush. The Parks Commission reserved decision.

Nelson, B.C.

This city was without electric light or power on Dec. 12 and 13 on account of an accident to No. 1 unit at Bonnington Falls at the inopportune moment when No. 2 was undergoing repairs.

The suggestion is made that the city have a great illuminated sign erected over the city's power house at Upper Bonnington, calling atention, in same neat way, to the fact that the big structure in question is the city's power house, or that Nelson is the electrical city.

North Vancouver, B.C.

The B. C. Telephone Company have been refused permission to lay the submarine cable across the inlet. The cable will have to be taken across either at the First or Second Narrows.

New Westminster, B.C.

One of the most important provisions in the new streets and sidewalks by-law before the city council is that all overhead signs, excepting those lighted by electricity, must be removed from streets.

The Western Canada Power Company is going ahead with the erection of the steel towers to convey the power from Stave lake to this district. A gang of men is engaged on the concrete foundations between Port Haney and Stave lake.

Owen Sound, Ont.

Town Engineer McDowall presented a plan for a line extending from Southampton, Bruce Co., by way of Owen Sound, Meaford, Thornbury to Collingwood. Blue prints of this plan are being prepared. Among the directors are representatives from each town.

Ottawa, Ont.

The Trades and Labor Council of Ottawa recommended that a municipal charter be taken out for a railway from the city to the cemeteries.

The Electric Department called for tenders on the 13th inst. for 60 ornamental posts; also 300 MacBeth Evans alba globes for 100 watt tungsten lamps.

The Public Works Department of the Dominion Government has given a contract to the municipal electric commission to light the Woods building and the Canadian building at $2 per light per year. It was claimed that the government was being overcharged by the owners of these buildings, of which it is the tenant and therefore decided that the building be rented without light and contract direct with the commission.

Application will be made at the next session of the Legislative Assembly for the Province of Ontario for an Act incorporating R. H. McElroy, T. A. Kidd, F. A. [illegible], J. S. R. McCann, George Boyce, J. C. [illegible], A. E. Baker, J. E. Caldwell, D'Arcy [illegible] Clayton, E. P. McGrath, W. J. Scott, M.D., D. Clark and C. L. Dickinson, and any others who may hereafter become subscribers to the memorandum of the company, a corporation under the name of the Ottawa, Smith's Falls and Kingston Electric Railway. With power to operate an electric railway from a point at or near the city of Ottawa to a point at or near the city of Kingston, and passing through the townships of Nepean, North Gower and Marlborough, in the county of Carleton; the townships of Montague, North Elmsley, Drummond, and Lanark, in the county of Lanark; the townships of South Elmsley, South Burgess, Kitley, Bastard, South Crosby and Leeds, in the county of Leeds, the townships of Pittsburgh, Storrington, and Kingston, in the county of Frontenac, and connecting with any and all of the various towns and villages situated in the said townships.

The Canada Gazette announces that the Imperial Traction Company will apply to Parliament for incorporation. It proposes to construct railway, telegraph and telephone lines from Hamilton, running through Guelph, Berlin, Stratford, St. Mary's, London, Ingersoll, Woodstock, Brantford and back to Hamilton, with branches to Niagara Falls and to Sarnia.

Dr. Eugene Haanel, director of the mines branch of the Department of Mines, recently returned from Nelson, B.C., where he inspected a private electric smelting plant for the treatment of complex zinc sulphide ores. The government last session set aside $50,000 for the construction of such a plant in British Columbia.

The town of Fort Frances has given notice that it will apply to Parliament for amendments to the Act incorporating the Ontario and Minnesota Power Company, and for remedial legislation respecting the rights of said town and company in relation to the electric power being generated by said company at Fort Frances.

The Ottawa Electric Railway Company has given a contract to the Ottawa Car Company for the building of 18 new pay-as-you-enter'' cars. They will be as big as the Britannia cars and will be suitable for use in both winter and summer. These will be finished by May next.

Many of the Carleton county councillors want the Ontario Government to take some action through the hydro-electric commission to provide the farmers of the county from the water powers along the Ottawa or vicinity the same advantages which it is providing the farmers of Western Ontario through the Niagara power.

Two power plans for Montreal have been presented for the consideration of the Minister of Railways; the first is by the Canadian Power Company, which seeks to enlarge its works at the Beauharnois Canal, while the Beauharnois Light & Power Company asks to enlarge what is known as the St. Louis feeder, a little canal at the St. Louis river, and having in view eventually a canal from the St. Louis canal to Beauharnois, 15 miles distant.

The proposition made by the municipal electric department for the illumination of Sparks Street has been accepted by the Board of Control, which will recommend the city council to grant permission for the erection of the necessary poles. The proposition of the Ottawa Electric Company to do the work was refused.

Preston, Ont.

Niagara power was used for the first time on Nov. 30. Two hundred tungsten lamps illuminated the streets.

Port Dover, Ont.

It is reported that the electric road between this place and Brantford will be built in the spring. Estimated expenditure, $900,000.

Port Arthur, Ont.

Port Arthur is now receiving its first power direct from Kakabeka Falls, over the new transmission line built by the Ontario Hydro-Electric Commission, on the contract entered into ten months ago. The supply now is 600 horse power.

Prince Rupert, B.C.

The by-law to spend $66,000 for a civic lighting plant carried by 117 to 5.

Penticton, B.C.

The municipal council is about to take out records on Penticton and Ellis Creek which will be a basis for supplying the town with 1,000 horsepower for power purposes. Five hundred horsepower will be developed with the installation of a domestic water service, work upon which will be commenced shortly. Five hundred horsepower will be in reserve for development when the occasion arises. F. Latimer, municipal engineer.

Porcupine, Ont.

The water power plant being constructed by A. E. Wallberg on the Metagami river will, it is stated, be completed by the end of June. This would furnish electricity for the Government road which is under consideration in that vicinity.

Peterborough, Ont.

The ratepayers will vote at the municipal elections on a by-law to give permission to Mr. C. E. Dittman the right to lay mains on the streets to convey natural gas to the citizens should it be found in sufficient quantity in the vicinity to justify the outlay.

Quebec, Que.

A franchise has been granted to the Dorchester Electric Company to enter the city from the south shore and to supply electricity in Quebec. The company will erect a plant. The estimated cost is about $200,000.

The People's Telephone Company, of Quebec City, are extending lines and rebuilding a lot of their old ones in Bay Island, Que. They have a gang of men now busy building from the east end of Stanstead Plain towards Heathton. It is understood that the whole system will be put in up-to-date condition.

Roche Point, B.C.

The Red Fir Lumber Company is said to be planning to build a new cedar mill in Roche Point, at a cost of about $100,000, which will be equipped for electric motor drive.

Rouleau, Sask.

It is proposed to construct an electric light plant, to cost about $60,000. Contract will be let next year. Engineer, J. D. Whitmore, of Regina. W. H. Stewart, city secretary-treasurer.

Regina, Sask.

Owing to a mishap to the exhaust steam turbine unit in the Regina power house this city is under-supplied with light and power. Commissioner McPherson, with Engineer Bull, will make a report on the need for additional generating apparatus.

The report of Engineer Bull in regard to the new power plant and equipment which he reports as necessary, contains the following recommendations for supply of material: One 1,500 k.w. 1875 k.v.a. turbine generator unit, 2200 volt, 60 cycle, three-phase, with direct connected exciter, f.o.b. Regina, $42,000; foundation for unit and condenser, $1,200; installation of exhaust piping and valves, $1,000; surface condenser, $5,000 square feet, with engine and circulating air pumps, f.o.b. Regina, $9,595. Total cost for installing the alternating current generator will be $53,395. City Solicitor Grooch was instructed to prepare

a by-law to raise the sum necessary for improvement required, $131,094.

A by-law was passed providing for the changing of the city rules regarding the restrictions on gasoline or gas lamps, so that instead of only electric signs being allowed all kinds may now be erected, providing they meet with the approval of the city engineer.

Revelstoke, B.C.

Revelstoke has instituted a permanent demonstration of electricity for heating and cooking.

Sherbrooke, Que.

Tenders have been called (Ross & Holgate, engineers), for the construction of a concrete dam and power house on the Magog River, near Rock Forest, for the city of Sherbrooke.

St. Mary's, Ont.

A copper line between Port Burwell and St. Mary's is being constructed by the C.P.R. company, to be used as a despatching line for trains. It is understood that it is the intention the company to install a telephone system between all the stations as an auxiliary.

Sydney, C.B.I.

The Cape Breton Electric Company will be asked to extend their tramway line to Waterford. To extend the line to Waterford from the end of the road at International Pier would mean the laying down of eight and three-quarter miles of rails.

St. John, N.B.

Following the successful operation of train despatching by telephone on other portions of the system, instead of telegraph, the C.P.R. has decided to install a teleline between this city and McAdam Junction and will commence despatching its trains by this method in the coming spring.

St. Thomas, Ont.

Profiting by London's experience, the 60 watt lamp order has been cancelled and higher power units will be installed.

The committee have awarded contracts as follows: Westinghouse, Hamilton, 1,000 tungsten lamps, at $1.25 each, f.o.b. St. Thomas; the other tenders were: Ingram & Davey, $1.28, f.o.b. St. Thomas; Dawson & Company, Montreal, $4.28 f.o.b. Hamilton; Canadian General Electric, $1.40 f.o.b. Toronto; Sanram & Roberts, $1.28 f.o.b. St. Thomas. The tenders of Packard & Company, St. Catharines, for light meters was accepted. St. Thomas gets a ten per cent. discount by combining its order with that of Galt. The Ferranti Company of Birmingham, England, will supply polyphase or power meters.

Township of Preston, Ont.

On Jan. 2nd a by-law will be voted on to issue of $36,000, 6 per cent. debentures for the purpose of aiding the People's Railway. Thos. Laughlin, clerk.

Toronto, Ont.

A system of train control by electricity was tried out on the C.P.R. on a short line in West Toronto. An engine with twelve cars attached travelling 45 miles an hour was brought to a standstill in 1,800 feet. Mr. Frank W. Prentice, Toronto, is the inventor of the system.

The Board of Control recommended the following awards: Reid & Brown, Toronto, 56 pillars at $36 each, and 700 lanterns at $1.61 each; Canada Foundry Company, Toronto, 140 pillars at $42 each, and 1,050 lanterns at $2.30 each; Flour City Milling Company, Minneapolis, 300 pillars at $35.28 each, and 5,000 lanterns at $1.3 7each.

A deputation of Queen street merchants requested the council to order an extension of the new five-light cluster electric lights system as far as York street west, and east as far as Church street.

A by-law asking $1,128,360 for municipal street railway extensions will be submitted Jan. 1.

A flat rate of $6 per k.w. per month has been fixed for signs, window and display lighting.

The York County Council, by a large majority, voted down a resolution endorsing the proposal of the city to take over the Mimico Electric Line.

Engineers representing the city and the Hydro-Electric Commission are examining and will estimate the value of the T. E. L. Company's assets. Mr. Alex. Dow will act for the city and Mr. Ross, of Ross & Holgate, with Mr. Sothman for the Commission.

The following resolution has been passed by the Board of Control: "That the city engineer and city solicitor be instructed to perpare all plans, specifications, estimates and conditions, necessary to enable the city to advertise for tenders from parties willing to undertake the construction and operation of an underground railway along Queen street from the City Hall to Sunnyside, with any underground, elevated or surface extensions which they consider would be immediately practicable."

Mr. E. M. Ashworth, of the Electrical Department, submitted the following system of lighting to the Board of Control: (a) For residential streets, 100 watt tungsten lamps, 80 c.p. each, mounted on concrete poles, 100 feet apart, on both sides of the street. Cost, $9 per year each, or 2.466 cents per night. (b) Main business street, ornamental cast iron pillars, each carrying five 80 c.p. tungsten lamps. Pillars to be placed 80 feet apart and to be fed by underground cable. Cost, $52.50 per year, or 14.39 cents per night. (c) Business streets and important intersections not in the underground district, for locations where the single lamps do not give sufficient illumination, clusters consisting of two, three or four lanterns, placed around the concrete posts, will be provided. No statement of cost. The prices quoted include capital charges, cost of renewals, inspection, and cleaning, and cost of current. The present price of arc lamps is 19 cents per night, or $69.35 per year; that of gas lamps, $20 per year.

Victoria, B.C.

The city council has adopted a report from the building inspector and the chief of the fire department recommending that all electric signs be placed ten feet above sidewalks.

A tentative rate of 1 1/10 cent per k.w.h. has been agreed upon when the Jordan River power reaches this city.

At the forthcoming civic elections, among other money by-laws to be submitted, will be one to authorize the raising of $25,000 for the purchase of electrical equipment for the extension and improvement of the street lighting system.

Vancouver, B.C.

It is rumored that the C.P.R. traffic between Vancouver and Westminster Junction will be handled by electric locomotives.

By the unanimous decision of the Court of Appeal, Mrs. R. S. Lyon was declared entitled to the jury's verdict of twelve thousand dollars for herself and two children for the death of her husband in the collision on the Interurban Electric Railway at Lakeview last year. The British Columbia Electric Railway Company pay the costs of their appeal.

Providing the British manufacturers can supply a submarine power cable capable of conveying a high tension current of 40,000 volts, the question of the obstruction of the river channel at the bridge, by high tension overhead wires, will be solved. The engineering department of the company has been instructed to get in touch with the cable manufacturers in England, and ascertain whether they manufacture submarine cables capable of carrying 40,000 volts.

For the first eleven months of the year traffic on the local lines of the B. C. Electric Company showed an increase of 213,213 passengers carried over the corresponding period a year ago. The total number of passengers carried from January 1 to November 30, this year, was 4,872,217. During the same period last year the total

was 4,650,004. For November the passengers carried numbered 455,752, against 422,678 in November a year ago.

According to the profit sharing principle which has been in force since 1902, the B. C. Electric Railway Company will this year distribute $60,000 among its employees. This amounts to about $57 each. The plan is being discarded, however, at the request of the men, who chose in preference a small increase in wages.

Weston, Ont.

The council of Weston is taking legal steps to prevent the Toronto Suburban Railway Company from selling power for lighting and other purposes in the village. The council has contracted with the Hydro-Electric Commission for a quantity of current and expects to be in the power-supplying business itself within a few weeks. The company claims it holds an exclusive franchise.

Welland, Ont.

The directors of the Niagara Falls, Dunnville and Welland Electric Company have decided to go ahead with the construction of the road for which a provincial charter has been secured. Franchises from the towns and cities and townships through which the railroad will pass will be asked for.

The report of Robert & Abbott, consulting engineers, on the cost of the Niagara Falls, Welland and Dunnville Electric Railway places the amount at about $1,000,000. The company has a provincial charter. The route will probably be from Niagara Falls to Dunnville, passing through Allanburg, Port Robinson, and Welland. The officers of the company are: President, F. R. Lavlor; Secretary, F. E. Misener; Treasurer, George Burgar; Provisional Directors: Franklin Buell, Dr. J. Carlton Gardner, George Arnold, and Hugh Rose.

Waterloo, Ont.

Following complaints by a number of Waterloo subscribers, the Bell Telephone Company will install a separate exchange in this town. For some time past both Waterloo and Berlin have been served from one exchange situated in Berlin.

Waneta, B.C.

Construction will shortly be started on the plant which is to develop electric energy at the falls near the mouth of the Salmon river. Apart from its usefulness to industries outside the valley, the project is naturally of the utmost importance locally.

Windsor, Ont.

The company which controls the electric light plants in Amherstburg and Leamington, have been seeking a franchise in Sandwich, as, it is rumored, part of a general plan to control the street and domestic lighting and power in all the principal towns in Essex county. The company, which is composed of Detroit capitalists, are also said to be negotiating for the Essex plant, and after Christmas will approach municipalities between Kingsville and Windsor seeking franchises for a power line.

Winnipeg, Man.

The St. James Ratepayers' Association considered a proposition made by the John King Real Estate Company, which has been put to the municipality of Assiniboia to run a railway at reasonable intervals on the streets which run north of the Portage road. They are willing to build the railway immediately the municipality will ratify their agreement as a by-law and have it passed.

The contract for supply of copper wire and cables were awarded as follows: E. J. Phillps, electrical works, Montreal, 200,000 pounds wire at 16 3-4c. per lb.; 100,000 pounds cable at 17c. per lb.; Wire and Cable Co., Montreal, rubber covered wire, total, $1,269. M. Peterson, secretary.

The right of the town of Selkirk to force the removal from its streets of poles, wires and other equipment of the Selkirk Electric Light & Power Company, whose franchise has expired, was upheld in the recent judgment delivered by Judge Macdonald. The company had a franchise for ten years, expiring in 1901, but was allowed to continue in business. Finally a by-law was passed declaring it had no rights, which by-law the judge upheld.

A special meeting of the consulting board of power engineers will take place on Dec. 30. There are several matters which will come up for discussion, among them the appointing of a power manager and the fixing of the scale of rates to be charged when the city's plant at Point du Bois is in operation.

The finding of the Court of Appeal in the dispute between the Winnipeg Street Railway Company and the city is to the effect that the company has no right to maintain poles on the streets for transmission purposes without the city's consent. On the other hand, the company's contention that they were not exceeding their charter rights in generating power at Lac du Bonnet was upheld. It was argued by the company that the transformation of power within the city limits was the equivalent of generation, on which point the Court agreed.

Electrical News

Generation, Transmission and Application of Electricity

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Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 20 Toronto, February, 1911 No. 2

Operation vs Construction

The Hydro-Electric Power Commission will do well to remember, at this time, that there are two distinct stages in the delivery of Niagara current to the people of Ontario, that these stages are vastly unlike in nature and extent and that they require in their performance types of ability of quite a different order. These stages are (1) construction; (2) operation.

The construction of the Ontario line is now all but completed and the substations, one by one, are being placed in commission. No one can doubt that the work has been most efficiently done. If there are any flaws, it is only owing to the fact that the amount of construction going on at the same time has been unusually large which has rendered impossible a personal supervision, by the engineers, of every bolt or every wire connection; a few months, however, or perhaps weeks, should show these weak points up and result in their gradual elimination.

And now, the all important work of operation begins, a more difficult task, in many ways, than construction, and covering an infinitely longer period. During construction, a faulty piece of work may be detected and replaced, an irresponsible workman may cause a delay of an hour or day or even a week, and the public knows nothing of it and suffers nothing; but once the delivery of power to twenty towns and cities has begun, once the factories and railways and homes become dependent on Niagara power, an hour's delay is a matter of national importance.

It is just at this point that the competition between municipalities and corporations actually begins, and the conditions under which the private interests operate would seem to be more favorable for two reasons: (1) All private business starts in a small way, and perfects its organization as it expands; its officers grow as their responsibility grows, and they know, by actual contact, all the varying conditions their enterprise is subject to. (2) Operation is a practical business, not a scientific theory; it is often best performed by mechanics with wide experience; the systematizing which prevents unnecessary accident, locates trouble quickly, and acts promptly in emergency, is the life work of a business man—always to be found associated with, nearly always in control of, a private company.

What the Commission needs now, too, almost above everything else, is trusty employees who can be depended upon, each, without fail, to perform that little piece of work for which he is employed and for which presumably his ability fits him. The whole system is only as strong as the poorest man. Such men are difficult indeed to get; the universities do not necessarily produce them; they may be known sometimes by the fact that they are not soliciting situations.

New Offices of The Canadian Electrical News

For the past eighteen years the general offices of the Electrical News have been located in the Confederation Life Building, Toronto. From time to time additional accommodation was secured to meet the growth of the business. This being no longer possible, we have now removed to the new building illustrated below at 220 King street west, where a most cordial welcome will be extended to our friends. Let the reader consider this a personal invitation to visit us in our new home.

New Headquarters of the Canadian Electrical News at 220 King Street West, Toronto

With the greater facilities and better equipment of our new building, coupled with an efficient organization, the Electrical News will not only maintain its present strong position, but will forge ahead to a much higher standard of efficiency and usefulness.

The Long Sault Development

The Long Sault Rapids question has not made much more progress at Washington than it did some months ago at Ottawa, and the present outlook is that the whole matter will be referred to the International Waterways Commission, which is now, under the new treaty, in process of formation.

The plans of the Long Sault Development Company proposed the development of some half million horse power, of which it was the intention to utilize 100,000 h.p. for the operation of the works of the Aluminum Company of America. The most strenuous opposition has been developed by the shipping industries, which claim that the enterprise would interfere to such an extent with the flow of the River St. Lawrence that the steamboat traffic might be destroyed altogether. The engineers who have given evidence are not able to say with any assurance that this would not be the case. This element of uncertainty may in itself be considered sufficient justification for delay, for it is unlikely that either country, having spent large sums of money on their canal system, would consent to the removal of this most important link. In the case of the Canadian Government, which even at the present moment is contemplating elaborate extensions to afford better inter-communication between the Great Lakes, this will be especially true.

The matter is one, however, which should adjust itself with time and the advances in scientific engineering. In many cases, as for example in the Trent Valley Canal system, the interests of navigation and of power development are both served by a judicious distribution of locks and the building of canals. Similar conditions will appear along the Ottawa River when the Georgian Bay Canal is built. The fact need not be lost sight of that such a power development as has been suggested on the St. Lawrence does not actually consume any water, and the time doubtless will come when all the water power of the mighty St. Lawrence will be controlled in such a manner as to admit of a much safer and larger navigation traffic than at present, with the accompanying asset of numerous tremendous water power developments. But the problem is an international one and may well occupy the attention of an International Commission.

From another point of view, too, the Canadian views the development of half a million horse power at the present time on the United States side, with distrust. Canada owns half the power of the St. Lawrence River. Who can say that such a development would not interfere with Canada's share or that it would not make the development of a similar amount on the Canadian side either impracticable from an engineering standpoint or prohibitive from a financial standpoint?

So it would appear that when the time is considered ripe to allow any development along this international river, the proper course to follow would be for some international body to consider both the questions of navigation and power development together and approve only such plans as will insure to Canada not only the free and safe navigation of her largest vessels, but also, at such time as we may require it, the unobstructed development of our share of the power. The initial expense may be greater, but not out of proportion to the ultimate advantage.

The C. E. A. to Affiliate with the N. E. L. A.

The meeting of the Canadian Electrical Association held in Toronto on January 20th, decided in favor of affiliation with the National Electric Light Association. This means the adoption of the constitution of the N. E. L. A. in respect to fees, the basis of which is company membership according to the population of the town or city.

The recommendation to affiliate was strongly opposed by Mr. Frederic Nicholls, Mr. O. Higman and others, who advocated the building up of a stronger and more truly national Canadian Association with no connection with a foreign organization. They further contended that no action should be taken on such an important question before the next annual convention, when there would be a larger and more representative attendance.

Messrs. A. A. Dion, R. G. Black and R. F. Pack championed the affiliation cause, which they claimed would result beneficially to the light and power interests of Canada.

As a result of the affiliation, a complete reorganization of the Canadian Electrical Association must follow. It is hoped that such reorganization will be acceptable to the membership in general, and that the progress which will be made will demonstrate that affiliation with the N. E. L. A. was a wise step.

The meeting also discussed some phases of the meter inspection service, particularly the advisability of having meters inspected **in situ** when their accuracy is questioned by the customer. This, it is believed, the Government will consent to do.

A communication was read from Mr. Chas. F. Roland, Industrial Commissioner of Winnipeg, suggesting that the annual convention of the Association be held in that city during the Winnipeg Exhibition, July 12 to 22. A committee was appointed to ascertain what railway rates could be obtained in case it were decided to hold the convention in Winnipeg.

The Commercial Committee of the Canadian Electrical Association held its first meeting at Krausman's Hotel, Toronto, the 20th inst. Mr. Eugene Creed, of The Toronto Electric Light Company, was in the chair, and the following members were present: Messrs. J. W. Purcell, Walkerville; T. F. Kelly, Hamilton, and W. H. McIntyre and P. M. Grimes, both of Ottawa. The meeting was somewhat informal, having been called by the chairman for the purpose of the members becoming acquainted with one another.

The chairman was instructed to communicate with the Central Stations in the Dominion, who are members of the Association, asking for their reports, methods of doing business, special rates, contracts, etc.

Annual Convention C. S. C. E.

The annual meeting of the Canadian Society of Civil Engineers was held this year in Winnipeg, during the last week in January. Through the kindness of the C. P. R. free haulage was given a special train conveying members from Montreal to Winnipeg and return and all members residing west of Winnipeg were given free transportation. The Eastern Passenger Association also carried members between Montreal and points east for one fare.

The entertainment programme included a complimentary luncheon by his Worship Mayor Evans and the Aldermen of Winnipeg, a complimentary smoker by the members of the Manitoba branch, a members' dinner in the Royal Alexandra Hotel and trips of inspection to the city power plant at Point du Bois, to the recently opened St. Andrews Locks and to the Grand Trunk Pacific shops.

A number of valuable papers were presented, among them being one descriptive of the installation work of the Point du Bois water power plant, which is being supervised by Mr. W. G. Chace, of the firm of Smith, Kerry & Chace. Another article descriptive of the same firm's installation on the Matabitchouan River in the Cobalt region was also read, the engineers in charge of design and construction in the latter case being Mr. N. R. Gibson and Mr. A. L. Mudge.

Electrical Time Clocks at Victoria, B. C.

The Victoria branch of the British Columbia Electric Railway Company some weeks ago inaugurated a system of electric time clocks in the down-town business section of the city. The original idea was to supply synchronized time to the various departments of the company's operations only, but the demand for this up-to-date timing method has spread

to the business community, so that the company are now prepared to execute all orders for the installation of clocks, and control these from the central master clock installed in the company's head office. At the present time the different departments of the company are served with electric time, and some fifty clocks have been installed in various public buildings, hotels, clubs and offices in the city. The Parliament buildings have had a complete installation made, including some very fine clocks; one in the legislative chamber being a particularly handsome 30-inch dial of white Italian marble. On the outside, the company have erected at the corner of Yates and Douglas streets an illuminated double dial clock for the timing of the street car system, and at the corner of Government and Yates streets another clock is placed over an illuminated sign, upon which is printed the full time schedule of the car service. The fact of perfect synchronism between all secondary clocks, and that there is no winding or setting required, is certainly a strong point in favor of electric time clocks, and there should be a wide field for these appliances.

Light and Power Rates in Stratford

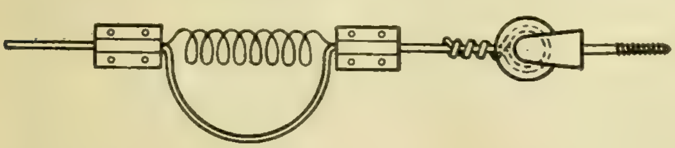
At a meeting of the Stratford Light and Heat Commission, a decision was reached on the lighting and power tariffs. The present lighting rate is 15 cents per kilowatt hour, with 25 cents monthly charge for meter rent. The new schedule offers two rates to consumers. One is 3 cents per month per 100 square feet, "outside dimensions of residence being taken, less 10 per cent. for walls, partitions, etc," with an additional charge of 6 cents per kilowatt hour, no meter charge, and a further reduction of 10 per cent. for prompt payment. The commission offers free carbon lamp renewals of 8 or 16 candle power.

The alternative offer is 9 cents per kilowatt hour, with no meter charge, and 10 per cent. discount, the lamp renewals also included. The standard power tariff recommended by the conference of engineers of Niagara power municipalities was adopted for this city. The new tariff will come into force on February 1, 1911.

Noise Caused By Service Wires

Mr. F. K. Martin, town electrician, of Battleford, Sask., sends us the following interesting item.

"I have had several complaints from customers who claim they could not sleep, on cold nights, owing to the noise caused by the service wires. I have tried several



times to overcome this trouble, to the satisfaction of the customers, and finally with success.

"I got a ¼-inch coil spring, 1½ inches by 10 inches and placed it on the wire with two clamps as in the drawing. This takes the direct strain off the side of the house which acts as a sounding-board.

"This suggestion may be of benefit to some of your readers who have experienced the same trouble."

Allis-Chalmers Making Record Turbines

The Stone and Webster Engineering Corporation, acting as consulting engineers for the Pacific Coast Power Company, has placd an order with the Allis-Chalmers Company for two 20,400 h.p., each, reaction turbines to be installed in connection with a new development on the White River, Pacific Coast. The turbines will operate under a head of 480 feet and run at 360 r.p.m. Each will be connected to a 60 cycle 3-phase 6600 volt generator.

The turbine runners will be of the high pressure Francis type with horizontal shaft. Water will be admitted to the runner through a cast steel spiral casing. The runner, which will also be of cast steel, will divide the water into two lines of flow which will discharge from the wheel by two quarter turns to separate draft tubes. The flow of water to the turbine will be controlled by a cast steel butterfly valve.

The spiral casing of this turbine will be the largest steel casting of this kind ever made. The butterfly valve is to be over seven feet in diameter, and will be the largest valve of this type ever used. The shaft, carrying the turbine runner, will be nearly two feet in diameter and the bearings for it will be about 16 inches in diameter. All parts of the turbine which will have to withstand the operating pressure of the water will be tested in the shops under a pressure corresponding to about 900 feet head.

The governors for these turbines will be of Allis-Chalmers standard oil pressure type and the specifications call for close speed regulation. A separate governor will be supplied for each unit and an elaborate central oil-pressure system will be employed.

The size of the exciter units has not yet been definitely determined, but there will be two of at least 500 h.p. each, one for each three units of the ultimate equipment. The exciter turbines will be of the impulse type and will be governed by means of a deflecting hood.

A separate steel pipe line will be built from the head basin for each turbine. These lines will be approximately 2,200 feet long and will be 8 feet in diameter at the upper end and 6 feet in diameter at the power house end.

Electric Heating in Great Britain

As to the introduction and sale of electrically heated household devices in Liverpool, it is found that the only two articles of such a nature known to any extent are electric radiators and electric flatirons.

The electric radiators are mostly of what is called the tubular lamp pattern. These range in price for a four-tube burner from $11 for a polished brass finished frame, coppered interior, and reflector, two switches, 22 inches high, 17 inches wide, and 6 inches deep, to a more fancy style, laquered gilt frame, 28 inches high, 16 inches wide, and 7 inches deep, which sells for about $24. The popular size would seem to be the four-lamp burner.

Another style not in so general use is the convector radiators, in artistic designs, taking about the same room as tubular lamp burners, and selling from $11 to $25.50. This style is the one generally used in street cars.

The use of electrically heated flatirons is quite general in this district. These average in price about $3.65 each, the greater number of which are imported from the United States. Dealers state the American flatiron gives much better satisfaction than the same article of English manufacture.

Electrical power for heating and cooking is sold by the corporation at the following rates: Up to 3,000 units per three minutes, 4 cents per unit of 1,000 watts; over 3,000 and up to 10,000 units, 3 cents per unit; over 10,000 units, 2 cents per 1,000 watts. An alternative method of charging is that of a fixed quarterly payment of 3 per cent, on the ratable value of the house, and a charge of 2 cents per unit on each unit as measured by the meter for lighting, power, or heating. The rates for ordinary lighting are much higher.

Field for Electric Signs in Bradford.

As the charges for electricity for domestic purposes have recently been reduced to 1 cent per Board of Trade

unit, it is thought that there will be a growing demand here for electrical devices. The officials of the Bradford electrical department are especially interested to learn of any new devices for electrical cooking and heating. There is a show-room in the department where electrical devices and apparatus are displayed, which offers an excellent oportunity to American manufacturers to send printed matter in regard to their goods or, better still, samples of their devices, which can be demonstrated to the public. Some American firms now have samples of their products on exhibition.

Electric signs are not much in use here, but this is a branch of the business that offers a good field for exploitation.

Electric Appliances in Glasgow.

An exhibition, with a view to diminishing the smoke evil by demonstrating to the public the advantages and benefits to be obtained by householders and the public at large, by substituting gas, electricity, anthracite coal, and other fuels in place of bituminous coal, was opened in Glasgow on September 16, and continued for three weeks with marked success.

The advantages of gas and electricity for domestic and industrial purposes were thoroughly demonstrated in a most practical manner by the corporation which owns and controls the city's gas and electric plants, as well as by the leading British manufacturers of various requisites for the use of gas and electricity for every conceivable purpose. The electrical department is feeling the benefit of the interest aroused for a purer atmosphere.

The report further suggests that American manufacturers or exporters looking toward this market should familiarize themselves with the exact requirements of the British market and exhibit their goods at the coming Scottish Exhibition to be held at Glasgow from May to October, 1911.

Protection of Service in Large Electric Plants

At the last convention of the Canadian Electrical Association a paper read by Mr. A. S. Loizeaux, of the Consolidated Gas, Electric Light and Power Company, Baltimore, on the subject of service protection, created widespread interest. Continuity of electric service is becoming each day more essential as we depend more and more on electric energy as the motive power for the varied activities of modern life. This paper was reviewed in the August number of the Electrical News, also printed in full in the Convention Proceedings.

Mr. Loizeaux's views were made the topic of discussion at the December meeting of the Toronto section of the A. I. E. E. Mr. A. L. Mudge reviewed the article at length, interpolating here and there explanatory remarks or making criticisms or suggestions as the various points in the paper were reached. In introducing the subject Mr. Mudge said:—

After we had listened to Mr. Sothman's interesting description of the Hydro-Electric Power Commission's system at our meeting two months ago, we adjourned to the Strachan avenue Terminal Station and I think that the most striking features of that station were the means taken for insuring safe and continuous operation. Based on the rated capacity of the transformers installed it was a 10,000 h.p. station, and we are accustomed to consider that the principal apparatus in a transformer station are the transformers. In the Strachan avenue station, there were two small compartments in the centre of the building. These two compartments containing the transformers, took up a very small percentage of the total space in the building, most of the remaining space being devoted to protective devices, the greatest and most effective of which is something you do not have to buy, but which usually costs a good deal if it is inside a building, i.e., air space.

Mr. Loizeaux's Paper.

It will be remembered that the plant described by Mr. Loizeaux had the switchboard operating rooms separated from the rest of the operations by wired glass partitions. This gave the operator a sense of security in case of accident and shut out steam and noise, at the same time allowing him full oversight over all the apparatus at all times. To this Mr. Mudge added that:—

"Many of us are interested in the design and construction of stations very much smaller than those of the type Mr. Loizeaux had in mind, and in reading the paper I propose to draw special attention to modifications which suggested themselves as being applicable to the design of stations of a very much smaller capacity.

The glass partition around the switchboard has been used in small water power stations for an entirely different purpose, i.e., to economize in cost of heating a station in winter, the switchboard compartment only being heated. This, however, has its disadvantages, as the station operator is not as closely in touch as he should be with all of the apparatus in the station and a station of this type has usually only one operator on duty.

Referring to prime movers the article spoke of the possibility of prime movers racing and wrecking themselves due to faulty governor action. On steam turbines devices may be attached to automatically cut off the steam supply. Mr. Mudge gave it as his opinion "that water turbines should be designed for and tested to stand full runaway speed at full gate and no load. This speed will usually be from 50 to 100 per cent. above normal rated speed, depending upon the design of the turbine. It is not feasible to design steam turbines and steam engines in the same way as the runaway speed may be much higher in proportion to the normal speed than is the case with water turbines. Generators which are to be driven by waterwheels should be designed for and given a short run at the runaway speed of the turbine. This test is usually made in the shops of the electrical manufacturer, and is sometimes more or less nerve racking to those who take part in it. An example along the line referred to above by Mr. Loizeaux occurred in one of the big New York power houses some years ago where there were a number of 5,000 kw. engine type generators with the generator switches fitted with overload relays. A bad short circuit occurred, the generator switches opened one after another until finally the armature windings of the last generator were seriously damaged before the circuit breaker opened."

Mr. Loizeaux's paper recommended automatic switches, operated by release load relays, in case of generator breakdown. The reliability of the reverse load relay was called in question in the convention discussion and found their chief defender in Mr. Leonard Andrews, who stated that several English firms were manufacturing an entirely reliable instrument. Mr. Mudge stated, however, that "reverse load relays in many cases have proved unreliable and in a moderate sized station it is not considered bad practice to use non-automatic generator switches, depending upon the operator to open them when necessary."

Speaking of the feeder system Mr. Mudge explained that "in many cases the bus bar compartments are entirely omitted. This would apply to extremely high voltages and to many moderate sized plants of all voltages, the high tension wiring and all bus bars being carried on high tension line insulators. A safe rule to observe with regard to wiring connections to bus bars is never to connect any lead sheathed cable between the bus bars and oil switches. If this rule is not observed a breakdown of a cable may put the whole station out of business. The double bus is

a luxury that cannot usually be afforded in the smaller stations and perhaps is not quite as necessary at 2,200 volts as at higher voltages."

Also with reference to the maintainence of an auxiliary steam plant it was pointed out that these became less necessary as long distance lines were more perfectly constructed. Many water plants operate in Canada without any auxiliary. Even where maintained they are inadequate to carry the load.

On the subject of lightning protection it was also pointed out that Mr. Loizeaux had neglected to mention the means of protection afforded to overhead lines by the use of a wire carried above all the line wires and grounded at frequent intervals. This is of great value for the protection of long distance lines from lightning, but has not been as frequently used in the protection of overhead distribution in cities.

Mr. S. E. M. Henderson, Canadian General Electric Co., Peterborough, though unable to be present, forwarded by letter a few comments on the paper, which read as follows:—

The paper of the evening describing protective schemes for large capacity stations is very interesting and we all like to hear occasionally about what the big companies are doing. Most stations, however, are quite small compared with those referred to and frequently quite a different policy must be followed in their designs. For these large stations, the automatic protective devices are sometimes designed especially for the particular conditions obtaining in that one station and do not represent, except in a general way, any of the regular protective devices on the market. Sometimes they are designed and made by the operating engineers themselves. The more delicate pieces of apparatus are necessarily in the care of expert instrument men and could not be kept in operating condition in the ordinary station with the ordinary type of operator. Small systems, therefore, cannot use such devices and the design of these stations should therefore be based on simplicity. The protective apparatus used should be rugged in construction, simple in operation and easily cared for. Of course the initial expense of the installation of these small systems must be kept down as low as possible; but when suitable protective devices cannot be put in to take care of the trouble, it may be necessary to spend more money in order to eliminate the possibility of these troubles. This method of design is preferable in any case, providing the money is available, and automatic protective devices should be looked on as undesirable compared with first-class installation. A good margin of safety on the insulation and on the capacity of the apparatus should invariably be allowed and the different devices should be inspected at regular intervals to see that they are kept in good condition.

There are certain protective devices on the market which are effective under certain conditions and not under other conditions. If proper allowance is made for the limits of these protective devices, they could be used more extensively than they are, with good results. In other words, if these protective devices are reasonably cheap, the central station should use them in order to eliminate one-third or half or some other proportion of their trouble in spite of the fact that the devices would not be operative in the other cases.

Under the heading, "Lightning Protection," reference is made to apparatus for relieving underground systems in case of electrical surges and the statement is made that in general such apparatus has been found more productive of trouble than helpful. This has undoubtedly been true in a number of cases, and yet there are numbers of installations of this apparatus where satisfactory operation is being obtained. There has recently been placed on the market an aluminum cell lightning arrester for the protection of cable systems, a special arrangement of the horn gaps being resorted to, to fulfill the different conditions of operation which are met with on underground systems. Several installations of these surge protectors or lightning arresters have been in operation for some time and the evidence indicates that they will be quite as satisfactory in their particular field as the aluminum cell lightning arrester has been found on overhead systems.

A number of engineers present at the meeting also added valuable suggestions. Among these were Messrs. R. G. Black, E. M. Ashworth, R. Hibner, A. S. L. Barnes, and A. J. Soper. Mr. Ed. Richards, who was presiding, spoke at some length.

Hydro-Electric in Hamilton

The inauguration of Hydro-Electric Power in Hamilton on December 21 was marked by a celebration lasting all afternoon and evening. Hamilton is not a co-operating member of the group of municipalites having contracted for 1,000 horse-power only, but the celebration lost none of its interest because of that. The three members of the Hydro-Electric Commission, local members of Parliament, members of the City Council and all the public boards journeyed in a special train to the Beach pumping plant, where the opening ceremony took place. Mayor McLaren made a brief address, after which Colonel Hendrie turned on the power. The new pumps were operated for a minute or so by the power, after which it was shut off. Col. Hendrie and W. K. McNaught, M.P.P., brought the proceedings to a close by brief addresses. In the evening the city tendered a formal banquet to the members of the Power Commisson. There were about 100 persons present and the occasion was a big success. The speech of the evening was made by Hon. Adam Beck, chairman of the commisson, who responded to the toast to the Hydro-Electric Power Commission. He went into an exhaustive resume of the work leading up to the completion of the transmission line which, he said, was made for the benefit of the people and not as a revenue producer for the Government. He said that the line would stand out prominently as an object lesson to the engineering world. Referring particularly to the local situation, Hon. Mr. Beck stated that the Power Commission entered Hamilton as a controlling element to the local power company. He claimed that the Cataract Power Co. had reduced its charges for lightng and power since it was known that Hydro power was to be introduced in the city. He further claimed that the commission could deliver power to the city for house lighting at a net charge of 3½ cents per kilowatt hour and no meter charge, as compared with the local company's charge of 8½ cents per kilowatt hour and a meter rental of 25 cents per month.

Mr. Geo. D. Leacock has been appointed travelling representative of the Packard Electric Co., Ltd., for the territory of Ontario from Kingston west to Sault Ste. Marie, with headquarters at Toronto.

Mr. E. A. Evans, formerly general manager of the Quebec Railway, Light and Power Company, and since the merging of all the electric interests in that city, Electrical Engineer to the Quebec Railway, Light, Heat and Power Company, severed his connections with that company at the beginning of the year.

Mr. W. C. Kellett, for the past four years general manager and chief engineer of the Grand Valley and Brantford Street Railways, has resigned and will devote his entire time to the construction and management of the projected line from Brantford to Port Dover.

The Makers of Electrical Canada—6

JOHN CUNNINGHAM McLENNAN—ADMINISTRATOR-PHYSICIST

The present generation is rapidly outgrowing the belief that theory and practice lead to inharmonious results. We are living in an age of scientific treatment of practical questions. The manufacturer, the engineer, the lumberman, the farmer, the financier, the statesman, one and all are coming more and more to base their hope of practical results on a foundation of scientifically established facts.

With this changed point of view we look hopefully to our universities to supply to the practical world that scientific or theoretical information which until the last decade the business world has held in quite too scant a respect.

The universities on their part, accustomed by long use to the epithet "unpractical" or "aesthetic," have been, in many cases, slow to recognize the change of feeling of the outside world, and whether from disinclination or from inability, have failed to meet the proffered advances, clinging with the tenacity either of self-satisfaction or of indifference, to the traditions of the past ages.

The Carnegie Foundation for the Advancement of Teaching some time ago set on foot an investigation into the operations of a number of universities and colleges, with a view to determining the type of work being done and the results attained in the medical departments of these institutions. The report was so eminently fruitful of results that more recently a second investigation has been launched. This time the physics departments are made the basis of the report. The man who was chosen to study the situation combines in a high degree experience in both the theory and the practice of life. He has studied the Physics Department of the University of Toronto, therefore, from the broadest possible point of view, recognizing to the fullest extent the absolute necessity that the university of to-day must, to fulfil its mission, combine all that is best in the world of theory and research with all that is best in the practical business world.

Professor J. C. McLennan

This report places the Physics Department of the University of Toronto easily in first place among a number of the best equipped and most capably managed universities on the continent of North America, and naturally gives credit for this most happy state of affairs where it is due, to the director of the laboratory, Professor McLennan.

Though unusually well known to all University of Toronto graduates as well as in a scientific way in every university of note the world over, it may not be out of place at this time to add a few words in detail of the life of the man who now rejoices in that he has brought honor to his university, for which he has worked unceasingly during some twenty odd years.

J. C. McLennan was born in Ingersoll, and is of Scotch descent. Like many another he worked as a boy because he had to, but, unlike most, he thrived on work and the more he worked the more he liked it. He brought this happy faculty along with him when he entered Toronto University in 1888. He had it when, after graduation, he was appointed to a minor position on the physics staff. He still had it as demonstrator and associate professor. He has it yet as full professor (since 1907)—such a tremendous capacity for work, such an insatiable thirst for research, along with an undoubted love of the subject he has chosen as his life study that those who know him best wonder least at his success.

The results which have been accomplished in the Physics Laboratory at the University of Toronto are the direct outcome of a combination of two clearly defined types of mind—the research type and the administrative type. As an administrator Prof. McLennan has shown special ability in the planning and fitting of his laboratory, every corner of which is made to yield "dividends," and in his constructive work for the Alumni Association, of which for years he was a most active secretary (and still acts on the council), being largely instrumental in strengthening the parent association and in organizing branches all over the continent. Of the less important may be mentioned his work in the reconstruction of the University Magazine and the carrying along of the University dining hall, to both of which he gave freely of his time and energy at a critical period, when each of these was an important link in the chain of the university's progress.

But it is for his work in research that Professor McLennan would prefer to be known and by which he actually is known, by reputation, in every institution of learning where the latest discoveries in electrical theories are studied. It began in 1896, when the famous Rontgen, for the first time, published his discoveries on X-rays, opening a field of research that has formed the basis of nearly all electrical theory since that time. That the physics laboratory of the University of Toronto has had its full share in the rapid advances made by electrical science during these years can perhaps be no better attested to than by the list of some 40 published articles, each dealing with a special research, which stands to its credit. A few only of the more important of these can be mentioned here, such as

"Electrical Conductivity in Gases Traversed by Cathode Rays;" "Some Experiments on the Electrical Conductivity

of Atmospheric Air;" "On the Radioactivity of Metals Generally;" "On the Potential Differences Required to Produce Electrical Discharges in Gases at Low Pressure; an Extension of Paschen's Law;" "On the Character of the Radiation from Ordinary Metals;" "On the Radioactivity of Natural Gas;" "On a Radioactive Gas from Crude Petroleum;" "On the Decay of Excited Radioactivity from Natural Gases;" "On the Secondary Radiation Excited in Different Metals by the Gamma Rays from Radium;" "On a New Method of Determining the Specific Heat of a Gas at Constant Pressure;" "On the Magnetic Susceptibility of Mixtures of Salt Solutions;" "On the Constitution and Properties of Heusler's Alloys;" "Note on an Improvement in the Method of Determination of Visibility Curves;" "The Absorption of Different Types of Beta Rays, together with a Study of the Secondary Rays excited by them;" "On Variations in the Conductivity of Air Enclosed in Metallic Receivers;" "The Action of Electrolytes on Copper Colloidal Solutions;" "On the Active Deposit from Actinium in Uniform Electric Fields;' "On the Penetrating Radiation at the Surface of the Earth;" "On the Physical Aspect of Colloidal Solutions;" "On the Resolution of the Spectral Lines of Mercury.'

During his connection with the university, it has been Professor McLennan's almost annual policy to study at one or other of the greater universities on the European continent. There can be no doubt that this policy has been rich in benefits to his own university, and that the experience and broader perspective resulting from actual contact with the highest standard of university work and management have played an important part in establishing the present efficiency of the Physics Department of the University of Toronto.

A University Conducted on Business Lines

Carnegie Foundation reports on Physics Department of the University of Toronto—A well-ordered building—Scientific Results of Superior Character

In a recent bulletin issued by the Carnegie Foundation for the Advancement of Teaching, on the subject of Academic and Industrial Efficiency, such unstinted praise is accorded the business-like management of the Physics Department of the University of Toronto that it becomes a pleasant duty to give the widest possible publicity to a report which demonstrates that this Canadian university stands in the very front rank when compared with some of the best the American continent has produced.

The report was made by Mr. M. L. Cooke, mechanical engineer, a graduate of Columbia. Mr. Cooke was chosen by the Carnegie Foundation to make a study of the efficiencies of a number of colleges and universities for the reason that his training specially qualified him for the position. In the preface, written by Dr. Henry S. Pritchett, he is described as "one of a group of engineers who specialize in the organization and management of industrial establishments and the installation in them of improved methods based on a scientific study of the results desired and the processes involved. The value of the report, therefore, lies not only in the care with which it has been made, but also in the standpoint from which the investigator has considered college work. That standpoint is the same which Mr. Cooke takes when he examines a manufacturing concern." It follows that the thoroughness and genuineness of the report cannot be called in question.

The accompanying photographs have been chosen with a view to illustrating the high order of architecture which has been judiciously combined with efficient and well-planned work rooms. The completeness of the building equipment is probably unexcelled in the whole world, and has been spoken of by one of the most notable scientists of the present day as "leaving nothing to be suggested." The spacious and well ventilated laboratories and research rooms, the well equipped work shop, an essential accompaniment of every laboratory and the neat little light and power plant, the removal of which to the central heating and power system, has, we think, been unwisely suggested, all

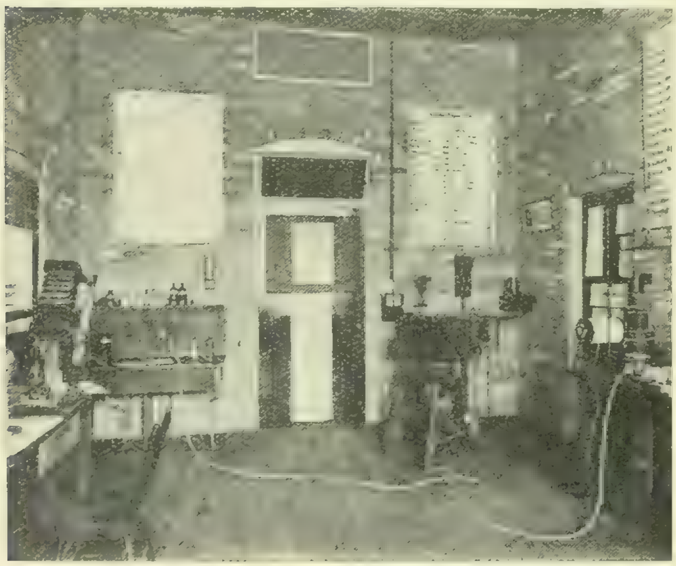
The Physics Building University of Toronto

speak of unusual forethought and good judgment in the construction of Toronto's Physics Building.

The bulletin deals especially with the quality of the work done and the administration. It is impossible to give more than a very general idea of the content of the report, but its full text is available, we understand, and may be had by anyone sufficiently interested, from the Carnegie Foundation.

The definite object of the report, as stated in the introduction, was to obtain an estimate of the cost and of the output both in teaching and in research in the department of physics in the following institutions: Columbia University, Harvard University, Massachusetts Institute of Technology, University of Toronto, University of Wisconsin, Haverford College, Princeton University, and Williams College.

In his preface Dr. Pritchett further states that the department of physics was chosen as the basis of the report for three reasons: first, because it was believed that physics considered as an integral branch of collegiate and university education is taught as efficiently as any



A typical Research Laboratory, Physics Building. University of Toronto

other; second, it includes lecture hall, laboratory and recitation room work; and third, because owing to the fact that it is a comparatively modern subject, it has accumulated less "moss" than perhaps attaches to some of the subjects which have been a regular part of the curriculum for centuries.

The type of organization found in the various universities is classified in the report, broadly, under two heads—the military or one-man management type and the committee type. The physics department of the University of Toronto is classed as the distinct type of military control. The department is administered almost entirely by one man having the title of director of the laboratory, a distinguished physicist with absolute control of his department. He had been selected for this place chiefly on account of his administrative ability, although his pedagogical and scientific attainments are also of a high order. The results which this man showed in his work afforded the strongest possible argument for the extreme of military control in an educational department.

Dealing specifically with the work of the laboratories, Toronto University received most generous praise, and far in excess of that accorded any of the other institutions. To quote Mr. Cooke's exact words:—

"Too much importance cannot be given, I think, to the order which obtained throughout the laboratory at the University of Toronto. I never have seen an industrial or commercial plant of any kind maintained in as good style. The floors were clean and in every instance the tables showed that the man who had last worked at them

Work Shop, Physics Building—University of Toronto

had made the condition in which he left them a matter of some thought. The apparatus, as it was placed in the cabinets, was put away in such a manner in the assigned places that any one familiar with the system could locate it. Especially I want to call attention to the condition of the research rooms in this laboratory. At every other place they were not conducted in such a way as to give the largest measure of efficiency, judged from an industrial

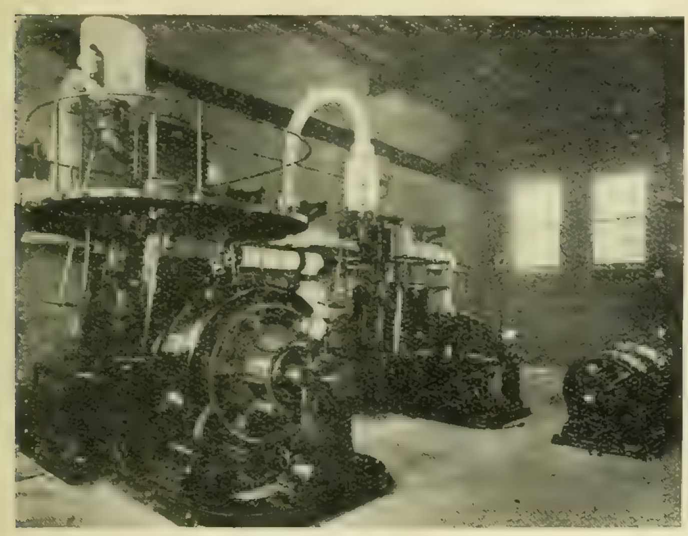
Electrical Laboratory, Physics Building—University of Toronto

standpoint. There is a tradition that Rayleigh, Kelvin, and some other distinguished physicists do good work under conditions of the utmost disorder; and without, of course, attempting to imitate them, there seemed to be a feeling that good work was not inconsistent with disorder. The research rooms at the University of Toronto could not have been kept in better order, and an inquiry made at

every place I went indicated that the scientific results of the work done in this laboratory were of a superior character."

At another point the report, referring to the development of student character and the formation of proper habits, says:—

"At the University of Toronto, after every laboratory exercise the apparatus which has been in use by the students is put away. If it is bulky and the table large, the apparatus is placed at the far end of the table and lined up with it. A neat unbleached muslin covering is then placed over it. In other words, each section leaves the laboratory free for the use of any section that comes after it, and the remarkable part of this is that in this particular laboratory there is so much space that there is no necessity for its conservation. It is done, I was informed, largely out of consideration for the development of the characters of the students and to teach them habits of neatness. I have never seen such a well-ordered building anywhere. Any industrial establishment with which I am familiar can learn from the Physics Department of the University of Toronto in the matter of housekeeping. Every other laboratory I visited had more or less to criticise in this respect."



Light and Power Plant, Physics Building—University of Toronto

The policy of the University of Toronto in popularizing the study of physics also met with favor. The report says in this connection:—

"Physics is undoubtedly a specialty, and I was interested to see what effort was being made to give it a broadening value. Here, too, I found all the extremes, from one institution where the professor felt that unless a person was interested in physics he did not care to make him so, to another where constant efforts were being made not only to emphasize the broad cultural value of physics to the student taking the course, but to make the entire university feel that the department of physics was one of the most interesting places on the campus, and one that must be safeguarded at all hazards. In carrying out this policy at the University of Toronto, there were lectures given during the year on such broad questions as measurements, energy, the theory of matter, etc., the entire university being invited to attend. The subjects were so treated, of course, that one not especially familiar with physics could comprehend them. It might give an erroneous idea of this work if I failed to add that there was not an excess of this kind of lecturing. It was not done with any idea of making physics easy, but to give physics a standing as a cultural study which it would not otherwise have possessed. It would seem that if in other branches this same effort were made to combine with the highly specialized treatment the expression of a broad application, learning as such would be much better understood in the community."

A number of statistical tables are appended, from which the following interesting facts are culled:—On the basis of the number of student-hours of work performed Toronto stands highest, with 90,270; the cost of teaching per student hour in Toronto is .69 dollars, the lowest with one exception; the total floor space occupied is 48,138 ft., the largest of all except Princeton, but only what might be expected in a new building planned for future growth; maintenance and operation of building expense per student-hour .08, as compared with .12 for Princeton; though performing the largest number of student-hours of work in number the Toronto staff ranks sixth; the percentage of entirely home-bred men on the staff is 64, the highest with one exception.

It is worthy of note also that the salaries paid individual professors in Toronto are lower than in four of the eight institutions covered by this investigation and that the total salaries paid the entire staff ranks sixth in numerical value.

The entire report is one which reflects the greatest credit on the university management in general and on Professor J. C. McLennan, director of the department, in particular, and should prove ample assurance to the graduates and friends of the University of Toronto that neither the administration nor the teaching methods of the physics department require further investigation.

Railway Trains Automatically Controlled

A Recent Test on C. P. Ry. Successful—Heavily Loaded Train brought To Rest In 30 Seconds—The System Briefly Described

We reproduce herewith two drawings which will explain the system of automatic train control which Mr. Frank W. Prentice, of Toronto, its inventor, has just seen successfully tried out on a section of the C. P. R. in West Toronto. Mr. Prentice deserves the highest commendation for his untiring perseverance in the face of unusual obstacles. The system now evolved after years of experimentation appears to be far and away the most complete and practical that has yet been placed on a working basis and inasmuch as it is operated by wave control appears to have eliminated many of the weak points in previous inventions.

There are two parts to this system; the part on the track, and the part on the engine. The essential features of the track portion, fig. 1, are the track circuit and the wave generator. The generating system as a whole, includes the transformer T, the condenser C, and the oscillatory discharge points PP. Such a set of apparatus is placed at the end of each block, and a wave wire of No. 12 aluminum is extended for a block length in the rear, run in a trunking midway between the rails as shown. The generating system

is controlled by the track circuits of the block in advance. As long as the current through the track circuits is not broken or short circuited, the a.c. relays R, keep the transformers connected with the a.c. feed wires, stepping the 110 volts up to about 22,000 volts, which causes an oscillatory discharge to continuously take place between the oscillators, PP. Connected to the oscillators are the insulated wave wire, W, and the pick-up wire, U, extending along the track in the relative positions shown. The wires W and U are charged with the wave producing current only when the block in

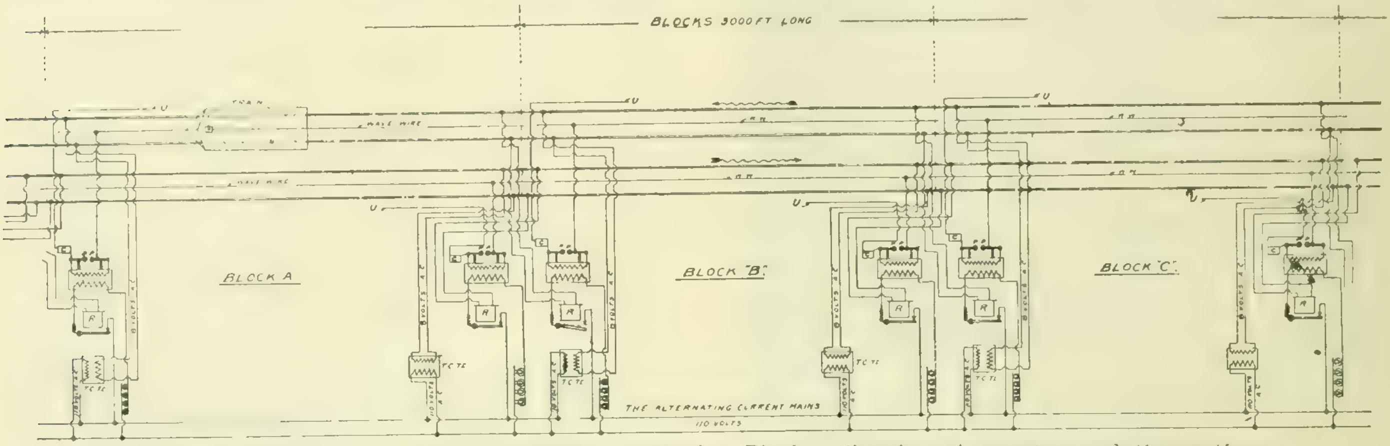


Fig 1 Diagrammatic Drawing of three Consecutive Blocks, Showing Apparatus and Connections.

advance is clear, and send out waves continuously as in wireless telegraphy. All the track blocks are provided with the ordinary form of vane type relays and a.c. track circuits.

The part of the system carried on the engine comprises (1) the main antenna, consisting of an aluminum plate four inches wide, by 19 feet long, and hanging directly over the wave wire.

(2) A pick-up antenna suspended in a like manner on the right hand side.

(3) A small turbine generator.

(4) The train control mechanism, chief of which is the coherer, fig. 2, 22 and 23, consisting of a wood fibre receptacle having a hole in the centre, and two lugs inserted in its

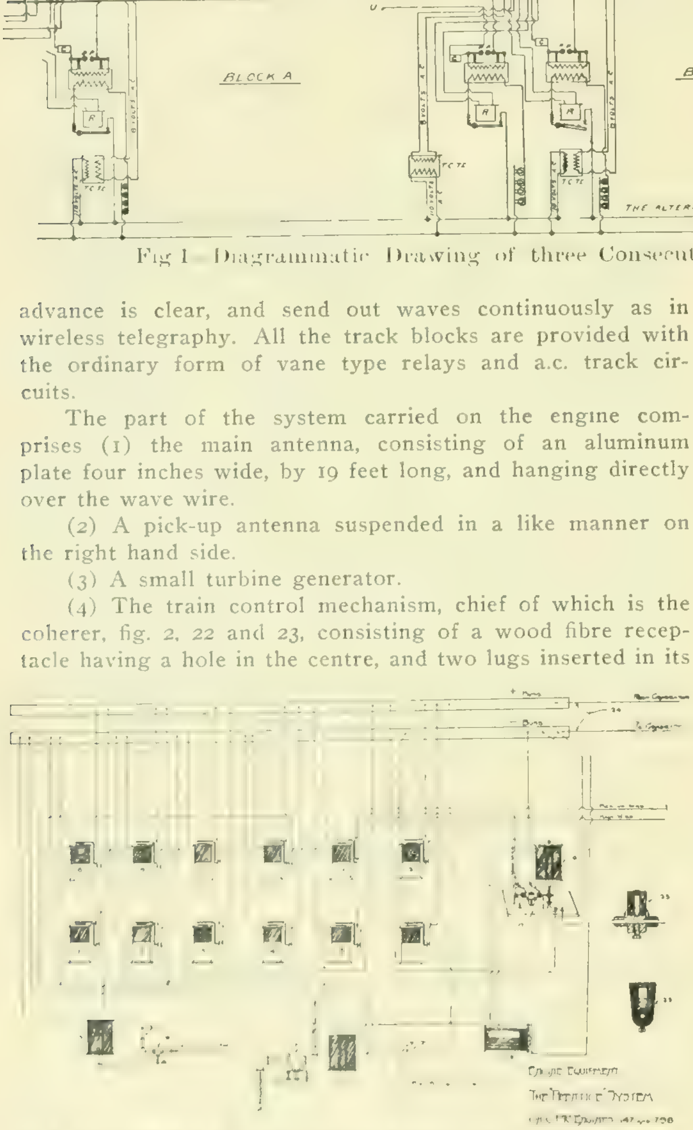


Fig 2 Diagram of Equipment carried by Locomotive

bottom ¼ of an inch apart, this space being bridged with filings.

The coherer is rotated through 90 degrees by a solenoid rack and pinion, being held in the upright position two seconds each time, in which position the wireless wave makes the coherer a conductor and the master-relay, 15, is operated. The rotation of the relay causes the filings to de-cohere.

The coherer is in operation constantly as long as an [illegible] opening and closing the master-relay every three seconds when the wave is being received. Connected to the master-relay is a series of ten hold relays, 3 to 12 inclusive. These relays will hold their magnetism one second each after the current is broken, and so, all being in parallel number 12 releases its contact just 10 seconds after the master relay ceases to be operated by the wave controlling influence.

Relay No. 7, when closed, operates solenoid 13, whose plunger holds valve 19 closed, which prevents the air from the main reservoir blowing whistle, 20. Relay 11 in the same way operates solenoid 14, which holds valve 18 closed, preventing the escape of air from train line through a one-inch port.

Solenoid 14 is also under direct control by the engineer through a push button, 21.

Relay 12 has a front and back contact and a common, connecting with coherer 17. When relay 12 is closed its common is in connection with the main wave wire antenna under the engine, and when disengaged is in connection with the pick-up antenna located under the steam chest.

When the engine enters the wave zone the wave is caught by the pick-up antenna, reaches the coherer through its contact on relay 12, closes master relay 15, which, in turn, closes relays 3 to 12. The engine is now under control of the wave, and as long as the wave is being received master relay 15 will be opened and closed every three seconds; consequently relays 3 to 12 will remain closed.

Suppose there is a train standing in front of the oncoming train, the wheels of the standing train short circuit the current and stop the wave. The coherer failing to receive the wave, the master relay, 15, remains open. In one second relay 3 opens and relays 4, 5, 6 and 7 open successively, each one second later, and in five seconds after entering the block solenoid 13 drops its valve, 19, and the whistle, 20, starts blowing; 4 seconds later relay 11 opens, de-energizing solenoid 14, the train line valve is opened, and the air brakes are being applied to engine 10 seconds after the trouble zone is reached.

In the actual test, which took place on Dec. 8, 1910, a train of 12 loaded freight cars travelling at the rate of 45 miles per hour was brought to a standstill under full head of 195 lbs. of steam in 1,300 feet, or about 30 seconds.

The members of the Sales Department of the Toronto Electric Light Company visited the terminal station of the Electrical Development Company on January 16th, and were shown through the plant by Mr. Woodhouse, the operator in charge. Through the courtesy of Mr. Boyd, the chief engineer, electrically made coffee and toast was served, after the men had had explained to them the workings of the station.

Hydro-Electric Equipment in London

Second to Toronto only in Size — Installations made with Great Care — Underground Distribution in busy Area — Lighting rate placed at 4½ cents

By E. A. Graham.

Decorative Electric Sign on City Hall, London

One of the most up-to-date and comprehensive municipally owned plants in Canada for the distribution of hydro-electric energy for power, lighting, and pumping purposes, is that recently installed for the City of London, which is second only to Toronto in the amount of power required from the Hydro-Electric Power Commission of Ontario.

This municipality was among the first to consider carefully the merits of Niagara power, and the people by a heavy vote indicated their approval of the project and by their loyal support, have in a great measure helped the Hon. Adam Beck, a faithful son of London, and his associates in the Hydro-Electric Power Commission to bring to successful completion one of the most difficult tasks of the age in electric power transmission. It has been a tremendous undertaking, both from an engineering and from a political point of view, and the people, by their broad minded and generous support, have helped greatly in solving at least the latter problem.

Committees of the Council were early appointed to consider the many questions arising in connection with the power distribution, and to their careful and able work under the leadership of Alderman Stewart is due much of the credit for the success of the undertaking. By a clause contained in the London Bill which was presented to the Legislature in 1909, power was given the Council of the City of London to prepare a by-law to transfer all public utilities to the Board of Water Commissioners to which more members were to be added. The by-law received its final reading at the last meeting of that year's Council, and on this reading, control of all electrical matters passed into the hands of the Water Commissioners.

The principal points of the station design, and the layout of the system of distribution were completed by former Engineer Sifton and his assistants, and the bulk of the contracts let before the spring of 1910.

The work of completing the installation has been carried on under the supervision of Chairman Philip Pocock, Secretary Elwood, Mayor Beattie, and Messrs. Darch, Chapman, and Wyatt, of the Board of Water Commissioners, Head Engineer Van Cleve, and Mr. F. R. Dark, General Manager of the Electrical Department. Mr. Wills McLachlan, recently appointed superintendent of stations, will be in direct charge of the electrical work, while line superintendent Alford looks after the line construction work.

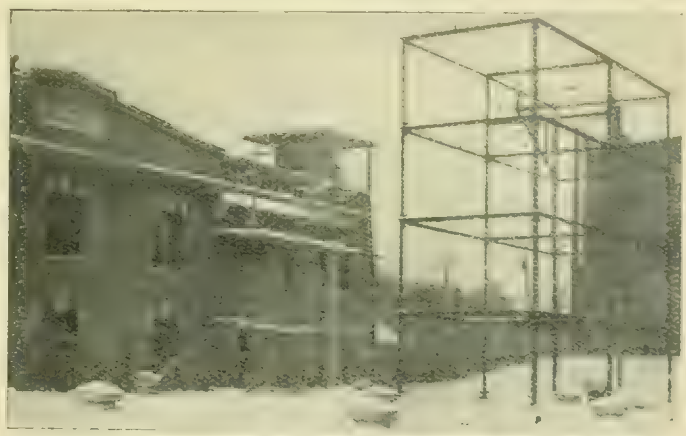
The high tension transformer station of the Hydro-Electric Power Commission is located on the Hamilton Road about three and one-half miles from the City Hall. A full description of the station, with diagrams, was published in the November issue of the Electrical News. The power is stepped down from the 110,000 volts of the Commission's lines to 13,200 volts at the sub-station at Hamilton Road and is transmitted three and one-half miles over two lines to Sub-Station No. 1, which is a combined distribution and pumping station. The total amount of power taken by the city is brought into this station and in addition to the low voltage distribution, one No. 000 transmission line goes to Sub-station No. 2, and the Springbank Pumping Station.

Lines

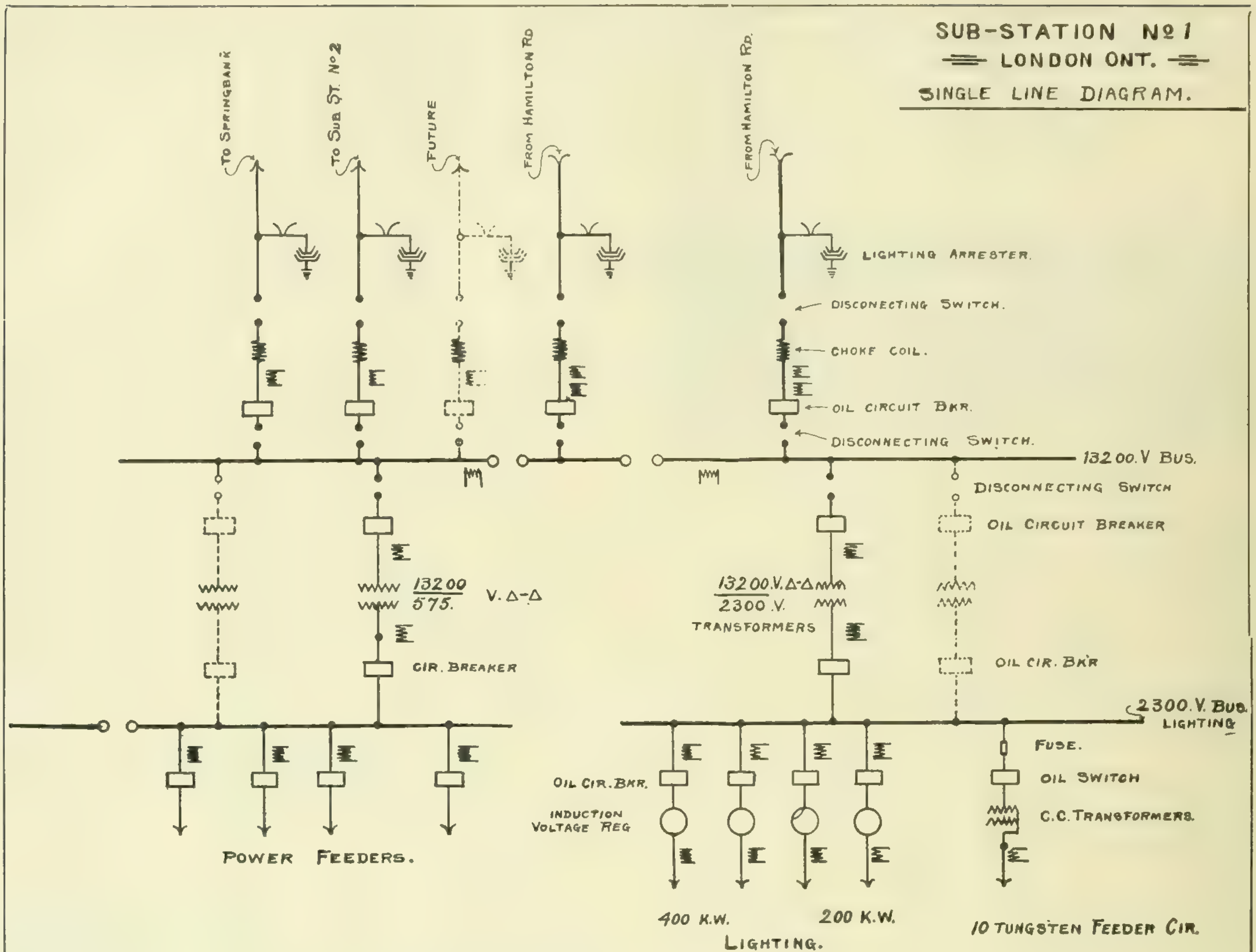
All 13,200 volt lines are carried on cedar poles, with treated cross-arms, as per the standard practice of the Hydro-Electric Power Commission. The insulators adopted throughout by the Hydro-Electric Power Commission for 13,200 volt service are used and wires are stranded aluminum cable. An overhead ground wire is carried above the lines on an angle iron support. All the low tension distributing lines through the city are carried on first-class cedar poles, according to most up-to-date standards in this class of work. For city distribution weatherproof copper wire furnished by the Wire & Cable Company is used throughout.

Sub-Station No. 1

Power is received at this station, which controls all power used by the Corporation, over two transmission lines of No. 000 aluminum cable at 13,200 volts. The current here passes through choke coils and oil circuit breakers of the latest approved designs to the distributing bus bars, from whence it feeds the step down transformers in the station or is transmitted to the other stations owned by the city. See diagram of Sub-Station No. 1. All the 13,200 volt apparatus is mounted in a reinforced concrete structure which is in an isolated room. A quick record of two weeks was made in the complete erection of this structure, which is over 43 feet in length and is a rather difficult piece of concrete work. The general connections of the station are shown in the single line diagram. The bus bars are sectionalized so that one line from the Hydro-Electric Station can take care of the entire lighting load of the station, while the other line cares for



Substation No. 1 Showing 13.200 Volt Line Entrance and Steel Tower



Single line Diagram Substation No. 1., London

the power load. Current and voltage transformers are provided for each section of the bus, so that the total lighting and power loads are shown graphically on curve drawing wattmeters mounted on the switchboard. The lines to Sub-Station No. 2, and Springbank are both tapped on the power side of the bus bars as they are both for power purposes. The 13,200 volt oil circuit breakers are operated by solenoids and controlled from the switchboard in the operating room. Every precaution is taken to isolate the 13,200 volt conductors and it is believed that the possibility of short circuits is very remote. The current is carried through 22,000 volt cambric insulated wire in fibre conduit to the transformer room in the basement. There are installed at present three 250 kw. 13200-2300 volt oil insulated water cooled transformers for supplying current for lighting purposes, and three 250 k.w. 13200-575 volt transformers for manufacturing purposes. One spare transformer is provided and provision is made for two additional banks of transformers similar to those described, making the capacity of the station in its present condition 3,000 kw., in addition to 750 kw. for Sub-Station No. 2, and approximately 500 kw. for the Springbank Pumping Station. There is also provision in the high tension structure for future 13,200 out-going feeders so that the station as laid out at present will easily handle 6,000 kilowatts.

Lighting Switchboard.—All of the power for street lighting and commercial and residential lighting is handled by a twelve panel Blue Vermont marble switchboard, all circuits being equipped with the best types of switching and metering devices. There are ten single phase circuits with constant current transformers for controlling the series tungsten street lights. There is also provision for one additional circuit giving a total rating of 166 kilowatts, sufficient for about 2,200-60 c.p. tungsten street lights. There are four main lighting circuits which are connected to the distribution system through one 40 kw. and three 20 k.w. constant voltage automatic induction type regulators which have a range of ten per cent. boost or lower, giving a total capacity for lighting of 1,000 kw. A contact making voltmeter is so aranged with compensating coils that it can be set to operate the regulators to secure a constant voltage at the center of distribution of each circuit. There are also on the swithboard voltmeters with compensators so set that the operator can tell at a glance the voltage at the switchboard. The large regulator is to be used for the down town commercial lighting circuits and near-by residential streets.

Power Switchboard.—The power switchboard comprises five panels at present, of which two are for the control of four 575 volt circuits for distributing power to the manufacturing establishments in the vicinity of the substation, two for the control of the 13,200 volt feeders to Springbank and Sub-Station No. 2, and one for the control of the high and low tension sides of the power transformers. All of the low tension circuit breakers are remote mechanical control and are mounted on gas pipe frame work behind the switchboard. There is also provided a storage battery board for the control of a 60 cell type M. 309 Gould Storage Battery, and a 5-kw. motor gen-

erator set for charging same. The battery is used for operating the electrically controlled oil circuit breakers, curve drawing wattmeters and relays, and for emergency lighting of the station. Three 5 kw. 2300-110 volt series transformers are used for lighting the station under normal conditions.

The 575 volt bus bars are carried to the switchboard which operates the motors used for the pumping scheme. These are controlled by a 5 panel switchboard furnished

13,200 V Lightning arresters, Hamilton Road Station

Distributing Tower at Pumping Station

by the Lancashire Dynamo & Motor Company and erected by the Electrical Construction Company, of London.

The constant voltage regulators and constant current transformers for street lighting were supplied by the Canadian General Electric Company, and all other transforming, switching and protective apparatus used in the station, except as otherwise noted, was supplied and erected by the Canadian Westinghouse Company.

All of the 2,300 volt and 575 volt out-going circuits are carried through lead cased rubber insulated cables to the basement of the building, thence on gas pipe racks through a subway to a steel distributing tower. Out door potheads are used on all these cables and are placed near the top of the tower, so there is no danger from short circuits at this point. All the low tension line circuits are provided with lightning arresters at the point where they enter the cables, and the 13,200 volt circuits are protected by electrolytic lightning arresters, which are mounted on the reservoir roof beneath the steel distributing tower for the 13,200 volt circuits.

Sub-Station No. 2

This station, which is to be used for the distribution of power to manufacturing establishments, is located in the eastern end of the city on Cabell street, and is equipped with three 250 kw. 13,200 to 575 volt oil insulated, water cooled transformers, fused type circuit breakers, electrolytic lightning arresters and distributing switchboard, and is intended to be left operating without constant supervision. There are a number of heavy power consumers in this vicinity, among whom are Geo. White & Sons Company and The McClary Manufacturing Co. All the apparatus is supplied and erected by the Canadian Westinghouse Company, Limited.

Over Head Distribution.

Power is distributed to the various sections of the city for lighting purposes through four 2,300 volt primaries which are carried on the best grade of cedar poles as before noted and are equipped with Shaw lightning arresters and with cut-outs at various points, so that one section may be removed temporarily from service without affecting the other circuits, and the whole of the line construction follows the most up-to-date practice. Power is distributed from the primary centers through transformers supplied by the Packard Electric Company. The transformers are of 10, 20 and 30 kw. capacity, depending on the amount of power required, the secondaries being designed for three-wire single phase distribution at 220 volts between the outside terminals of the transformers and 110 volts to the center tap.

The city makes all the house connections free of charge and places in each residence a wattmeter, for which no rental is charged. All the wattmeters used on the system are supplied by Ferranti Limited, through Geo. C. Royce, Canadian representative.

Underground Distribution.

The present layout for underground distribution covers four blocks on Dundas street and five blocks on Richmond street. The transformers for feeding this underground distribution are located on poles on side streets, and feed through laterals to manholes in the main lines of the conduit work. Manholes are located about every 300 feet on one side of the street, set at cross streets, where there is a lateral joining the two lines of underground work. Service boxes are located at intervals, depending on the amount of power required for future as well as present uses, and the underground work in general is laid out for 100 per cent. increase over maximum present requirements. Sixteen clay ducts are laid out on the north side of Dundas street and four on the

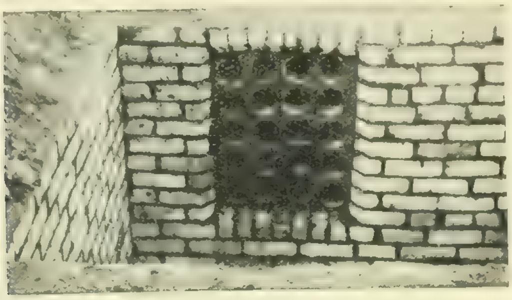
Underground Distribution of Light and Power, London

south side. Twelve on the east side of Richmond and four on the west side. There are 22 manholes and 48 service boxes and approximately 80,000 lineal feet of tile duct. There are 264 service connections to buildings in this section, this not including connections to ornamental

lamp posts, which will be treated under a separate heading. These ducts will be used for lighting purposes and small power users. 575 volt circuits will be installed for heavy power users, which include any power requirements above 5 h.p. Provision is also made for renting ducts to telegraph and telephone companies. The photographs shown herewith illustrate the character of the work. All of this work was done by the Safety Insulated Wire & Cable Co., of New York, under the supervision of the City Electrical Department.

Street Lighting

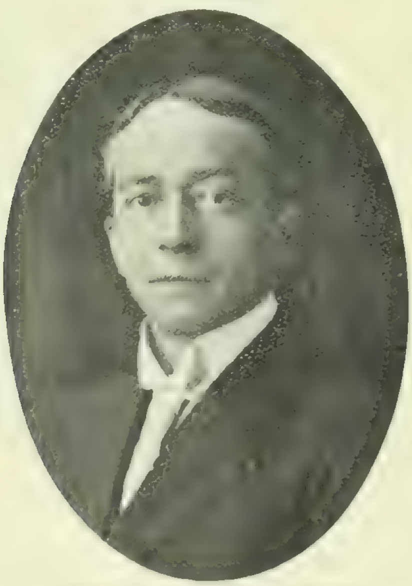
Chairman Pocock's prophecy that "London would be lighted as never before" has been more than fulfilled. There are installed at present 1,600-75 watt 0.6 ampere



Brick lined Manhole, Showing Conduit terminals

tungsten lamps complete with Wheeler reflector and mounted on the poles with side brackets about 17 feet above the ground and spaced about 300 feet apart. The light distribution from these lamps is much better than with the open arcs, but it is further proposed to increase the amount of illumination by installing additional lamps until spacing is 150 feet. This system of street lighting is particularly advantageous in London on account of the great amount of foliage.

The underground district will be lighted by eighty ornamental posts, upon each of which is placed five 100 c.p. tungsten lamps with Alba globes. These will be fed



Chief Engineer Van Cleve

by a low voltage system from the conduits now installed. Owing to the severe winter weather the ornamental posts and cables will not be in service until spring, and in the meantime the underground district is lighted by festoons of incandescent lamps which, through the courtesy of the Street Railway Company, have been strung from pole to pole along the sides of the street.

The tungsten lamps and reflectors were supplied by the Canadian General Electric Company, the iron brackets by the Dennis Wire and Iron Company, of London, and the ornamental lamp postss by the Vulcan Iron Works, also of London.

The contract between the city and the London Electric Company expired December 1st, and on the night of November 30th, Hon. Adam Beck and Chairman Pocock, of the Water Commisioners, closed the switch that threw the power on the city's lighting circuits, so that for one night the city was lighted by Hydro-Electric Power and by the London Electric arcs, and on the night of December 1st all the city lighting circuits were in first-class operating condition, and have so continued with but few interruptions of the power supply.

Lighting Rates

The rates for all lighting have been placed at five cents per kilowatt hour less ten per cent. for prompt payment. It is expected that twenty-four hour power will be available after January 1st, and in addition to a very large number of lighting consumers, there is over 600 h.p. in motors ready to run with Niagara power. This does not include over 800 h.p. required to run the pumps for the

Manager F. R. Dark

city's water supply, and which are now running at night, and pumping water into the city's mains.

Power Celebration.

It was decided to hold an exhibition to celebrate the arrival of Hydro-Electric power and to enable the various manufacturers to place their electrical appliances before the public so they might see the advantages of using electric power for heating and cooking as well as lighting their homes. To this end invitations were sent to the various manufacturers and the use of the Armouries was secured for three days, beginning December 20th. Additional festoons were placed on the streets, the various public buildings were decorated and illuminated and a large and striking electric sign shown in accompanying figure, was placed on the City Hall. The armouries were decorated outside, and red and white festoons were strung from the flag staff to the armoury towers. Inside the armouries the ceiling was a blaze of light from the festoons which ran in all directions from a colored center piece suspended from the roof trusses. The keynote of the entire celebration was light, and there was plenty to satisfy the most critical.

The exhibition was formally opened at 8 o'clock, December 20, by Mayor Beattie, with Alderman Richter

presiding. Addresses were made by Hon. Adam Beck, Chairman Pocock of the Water Commissioners, Chairman Richter and Mayor Beattie. The 7th Regimental Band provided excellent music each day.

Among the exhibits were the following:—

The Northern Electric Company had a large and comprehensive exhibit of telegraph and telephone and fire alarm appliances, heating apparatus, and Wagner single phase motors.

Benson and Wilcox Electric Company showed a large and well selected lot of lighting and decorative fixtures and irons, toasters, and other heating appliances.

The Canadian Tungsten Lamp Company had a striking display of tungsten lamps ranging from 25 watts to 600 candlepower. That they were kept busy answering questions showed that the people realize the necessity for better light in the home.

Ferranti, Limited, of Toronto, had a large display of irons and heating devices and of Ferranti wattmeters, and portable meters.

The Simplex Heating Compay confined their display entirely to a demonstration of electric ranges, and the larger cooking and heating appliances.

The Electrical Construction Co., of London, exhibited a number of fixtures, and as agents for the Lancashire Dynamo and Motor Co., explained the merits of their motors.

A. H. Winter Joyner specialized on the Helois Flaming arc lamp.

The Commercial Electric Co., of London, showed a complete line of fixtures, conduits and general apparatus for residential wiring.

The Chapman & Walker Co. exhibited a line of motors they are handling.

The Canadian Westinghouse Co., Limited, had a large and well-arranged exhibit of meters, heating appliances, and industrial applications of small motors.

Several booths were arranged by the city to show the application of hydro power to the home and to the office, and information concerning rates was distributed.

The exhibition was very creditable and proved of great value in educating the general public regarding the many uses to which cheap power may be put.

Commission's Port Arthur Work Completed

Transmission Line from Kakabeka Falls—City now Equipped for 5,000 h.p. Careful protection against Lightning—Substation planned for ultimate 10,000 h.p.

In the magnitude of the work now just being completed by the Hydro-Electric Power Commission in Southwestern Ontario, one is apt to lose sight of the fact that this Commission has been active in other sections of Ontario. The field of action of the Commission is, in fact, very wide, and the work done in the last two or three years includes investigations and reports on the hydro-electric situation in many different parts of the province.

Some two years ago the city of Port Arthur, foreseeing the need of more power in the near future, requested the Commission to investigate the conditions there and make arrangements for an additional supply. As a result nego-

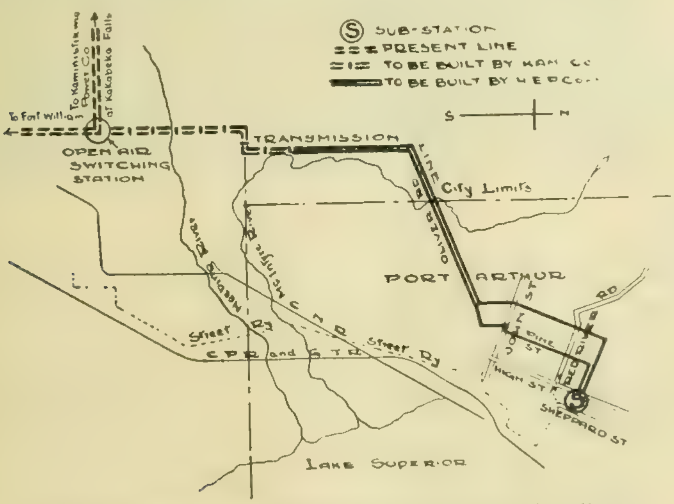


Fig. 1—Port Arthur's High Tension Transmission System

tiations were opened with the Kaministiquia Power Company and arrangements reached on terms very similar to those existing in Southwestern Ontario. The Port Arthur extensions have gone along side by side with the larger installation, and now with the new year comes the announcement that Port Arthur is regularly receiving electric power from the Kaministiquia Power Company's plant at Kakabeka Falls over the high tension transmission lines built by the Ontario Hydro-Electric Power Commission.

The wisdom of this piece of foresight on the part of the Port Arthur authorites is well shown in the conditions

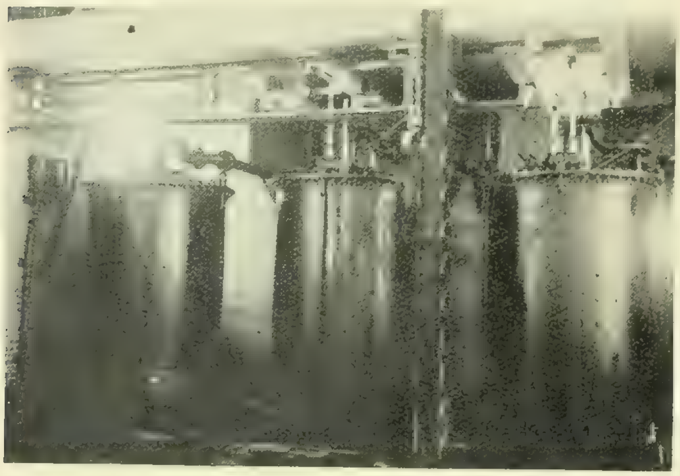
Fig. 2—Exterior Substation, Port Arthur

existing in that city during the last couple of months. The original supply was generated at Current River, where about 2,000 h.p. was available. The rapid growth of the city, however, with the accompanying extensions to street lighting, street railways, etc., had overtaxed the supply of the former plant so that even within the last couple of months of the old year the demand was in excess of the supply and the addition comes at a time when delay would have meant much in retarding Port Arthur's industrial development. The agreement between the Power Company and the Commission calls for a supply of 1,100 horsepower at the start, which amount may be increased to 10,000 horsepower; the prices to be as follows:—$17 up to 2,000 h.p.; $16 for all up to 4,000 h.p.; $15 for all up to 6,000 h.p., or $14 for all up to 10,000 h.p. or more. The other conditions for peak load, minimum liability, etc., are practically the same as obtains

in the agreement with the Ontario Power Company at Niagara Falls.

The Kaministiquia Power Company has its generating plant at Kakabeka Falls, where the present development is about 35,000 horsepower with possibilities of extension to 100,000 h.p. or more.

The plan of the transmission system is shown in Fig. 1. The main line of the Kaministiquia Power Company is a double circuit, double pole line connecting the generating plant with Fort William. At a point on the Fort William line, shown in this figure, about nine miles from Port Arthur,



3—750 k. v. a. Transformers, Port Arthur

a simple outdoor switching tower is built and a double transmission line leads off to Port Arthur as shown. The first half of this line was built, by the agreement, by the Power Company, the remaining part by the Commission. For the most part these lines follow the highway, one on either side, but within the city limits the two pole lines are separated for some distance. Wooden poles are used throughout.

Special provision has been made against lightning troubles common in this district. Each pole line carrying three transmission cables, is also supplied with two protecting cables, one on the pole peak, the other on the end of the

Structural work, Port Arthur

upper pole arm. These protecting cables are grounded every fifth pole. Unusual precautions are also being observed within the sub-station.

Transmission is at 22,000 volts, 3-phase, 60 cycles. Current enters the station through oil switches, automatically operated and supplied with overload relays and passes to a high tension busbar. The lightning arresters are of the European type. At the present time only one bank of transformers is fed from the high tension bus. This consists of three 750 k.v.a. single-phase, 60 cycle 22,000-2,200 volt units, star connected on the high side, delta connected on the low side. A spare 750 k.v.a. unit is also installed and so arrang-

Open 22,000 volt work over Transformers

ed that it may be substituted, in a few moments, for any unit in the bank of three. All transformers are oil-insulated and water-cooled.

Provision is made for the insertion of oil switches between the high tension bus and the transformers which will be necessary when the second bank is installed.

The low side of the transformers feeds two sets of busbars from which the city operates six 2200 volt feeders, each provided with a 3-pole double-throw oil switch within the sub-station. The old Current River plant may also be connected to these low tension busbars and switches are so arranged that any one or more of the six city feeders may be fed from this plant at any time.

All the electrical apparatus in the station was supplied by the Siemens Brothers Dynamo Works.

The city is also installing within this sub-station a motor generator set for operation of the Port Arthur Railway system. This consists of a 750 k.w. 2200 volt 3-phase synchronous motor and a 600 volt d.c. generator. These also were supplied by the Siemens firm.

The present building, shown in the figure, is planned to accommodate a second bank of transformers which will bring the capacity of the station up to 4,500 k.v.a.; also the interior layout is so planned that by extending the building at one end the capacity may be increased to any amount.

Trade Inquiries

1952. **Agents.**—A Birmingham company manufacturing electric, oil and gas fixtures of every description in brass, copper and wrought iron is anxious to appoint first-class Canadian agents.

30. **Electrical switch gear, etc., etc.**—Inquiries have been received from United Kingdom firms for the names of first-class Canadian firms open to handle the following:—

(a) Electrical switch gear; (b) hydraulic and electric hand lifts, crabs, cranes and switches; (c) hydraulic and sanitary plant (pumps); (d) revolving shutters and collapsible gates; (e) air compressors and refrigerating machinery; (f) steam engines, oil and gas engines, boilers and boiler house accessories; (g) staircase and pavement lights; (h) street railway cars, railroad cars, trucks, cars and wagons of all descriptions.

34. **Electrical slate.**—A London firm manufacturing electrical slate for insulating purposes, plain and enamelled, and also slate manufactured into tanks, shelves, etc., wishes to extend its business to Canada.

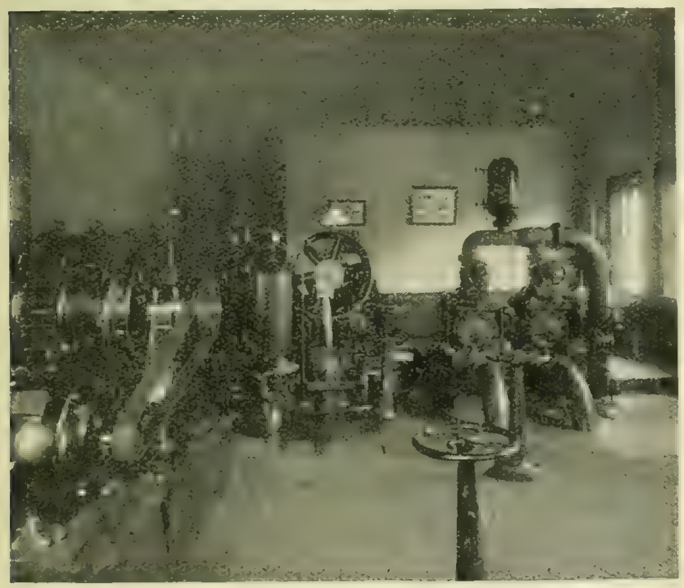
Bracebridge now has Three Water Plants

Third Plant Commenced Operations with the New Year — Low Capital cost of $53 per h.p. makes a price of $12 per h.p. year possible—High Falls next

The Town of Bracebridge formally opened its third municipal hydro-electric power plant on the twenty-ninth of December and its enterprise was well rewarded, its operation being successful in all respects.

Bracebridge, which is situated on the Muskoka River on the Grand Trunk Railway, has a population of 3,000 people, and early took advantage of a power site on the north branch of the Muskoka river within the town limits. Two falls, which combined are called Bracebridge Falls, in the town, were first developed and the Wilson's Falls plant, two miles north of the town, on the same river, is now complete; the whole of the power so developed has been marketed and the prospects of the demand of the near future have necessitated the acquiring of the rights to develop High Falls, four miles from Bracebridge. The North Muskoka River will then be developed in four places, all plants working in parallel on the Bracebridge load.

The general location of the North Branch of the Muskoka River is in the upper Muskoka Region, the main head-

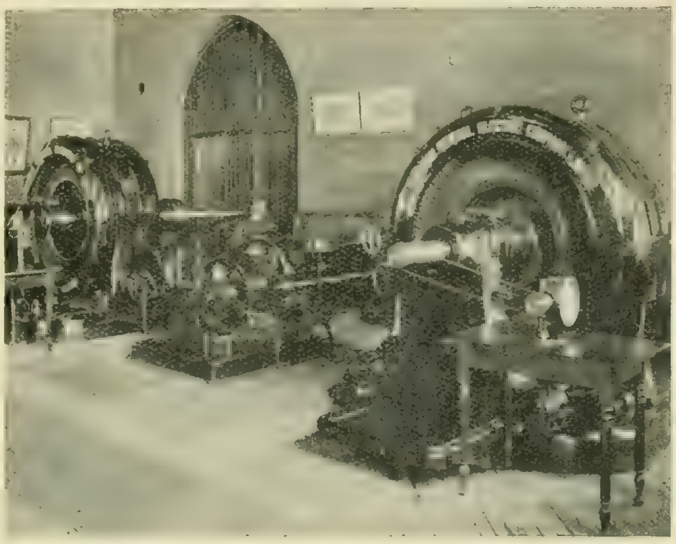


Interior No. 1 Power Station, Bracebridge

waters being chiefly in and around St. Mary's Lake, Peninsula Lake, Fairy Lake and Lake Vernon. The total area of watershed of this river above Wilson's Falls is upwards of 500 square miles. The country in the watershed is very rocky and broken, the rivers being contained between high rock banks. The land has been lumbered for many years and such forest as is now standing is mainly second growth; this condition results in quick spring floods of short duration with a long period of low water in the autumn and usually again in February, the latter due to cold weather conditions. On this account a regulating dam is maintained at Port Sydney at the head of the river. The minimum flow of the river has been found to be 265 cubic feet per second.

The principal power market in Bracebridge, aside from the municipal requirements for lighting and power, are two tanneries, linen, brick, planing and chopping mills, grain elevators, etc. The Anglo-Canadian Leather Company has an installation requiring 500 horse power, the Muskoka Leather Company takes 125 horsepower and the Dominion Linen Co. 85 horse power, while motors in other establishments vary in size from 20 h.p. down. A considerable market has been secured for domestic irons and small motors. Power is sold as low as $12.00 per horse power per year, and even at this low rate the town gains a considerable profit; the attractive power market warrants the extensive municipal development policy now undertaken.

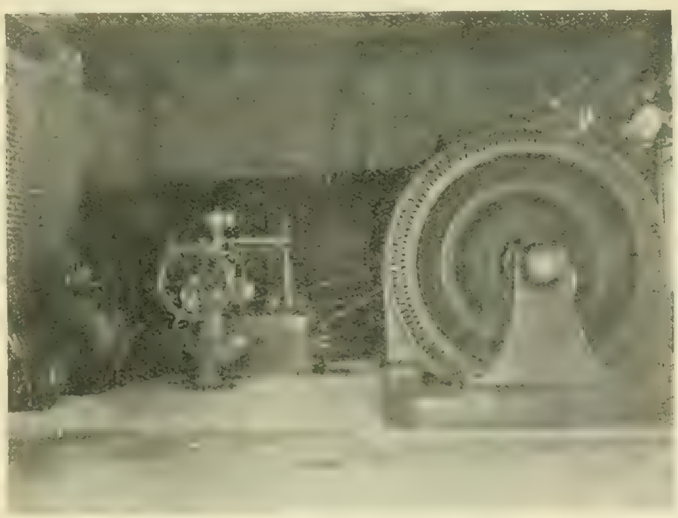
Plants Nos. 1 and 2 utilize Bracebridge Falls, which has



Interior No. 2 Power Station, Bracebridge

a head of 51 feet. The town owns half of the upper portion, which has a head of approximately 16 feet, and all of the lower fall, having 35 feet head.

No. 1 plant on the upper fall was placed in operation in 1892, having a generator for lighting only. The power house now contains one 125 h.p. S.K.C. alternator and the two pumps for the waterworks system. A particular feature

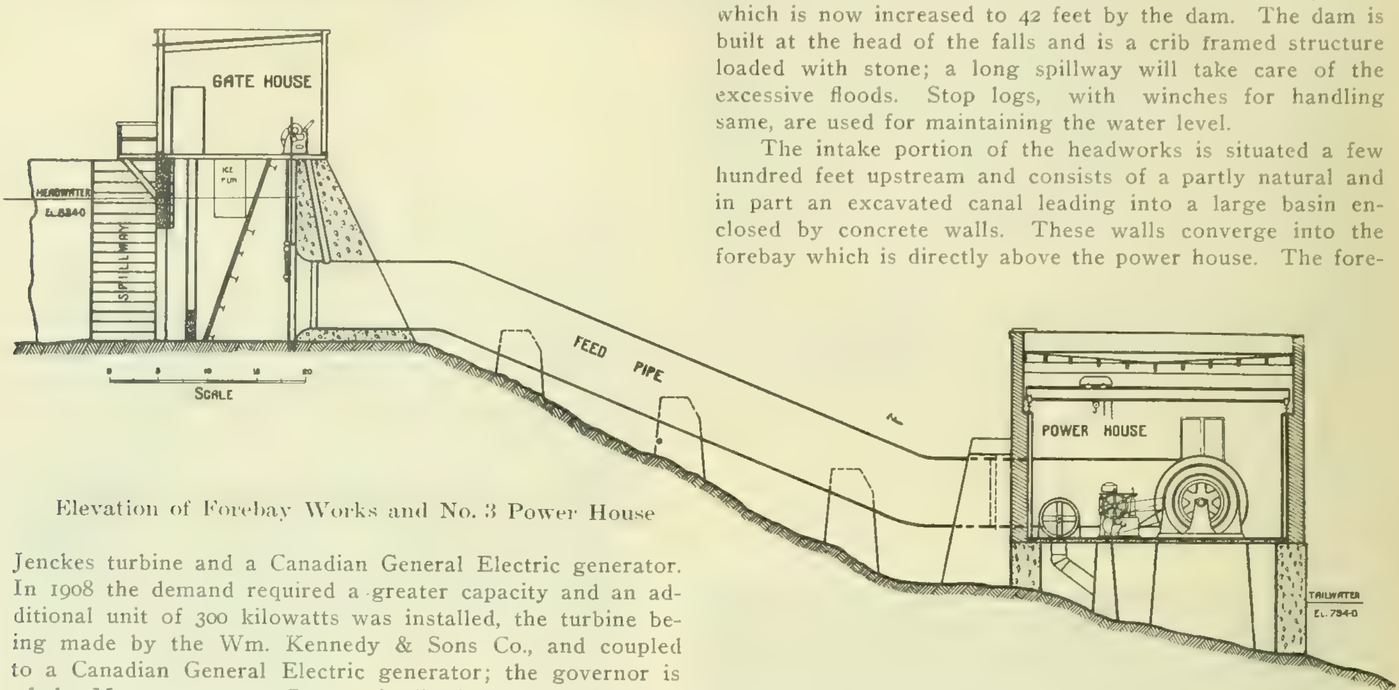


Interior No. 3, New Power Station

of this electric plant is that the generator is run in parallel with No. 2 plant and has no hydraulic governor, being held to speed by synchronism with the No. 2 generators. Their

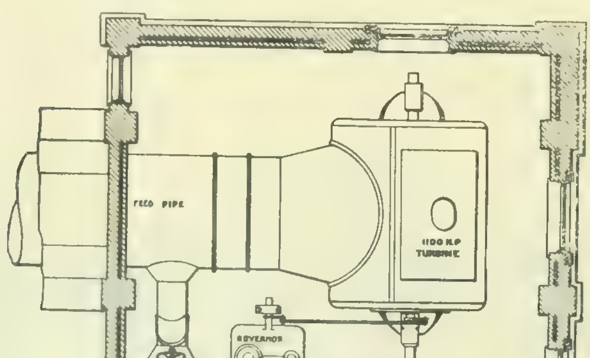
operation is so well controlled that often No. 1 plant is put in operation, the doors locked and no further attendance is required until it is shut down.

No. 2 plant has two power units and two exciters and aggregates 750 h.p. The first generating unit was installed in 1901 and is of 250 kilowatts capacity. It includes a Jenckes turbine and a Canadian General Electric generator. In 1908 the demand required a greater capacity and an additional unit of 300 kilowatts was installed, the turbine being made by the Wm. Kennedy & Sons Co., and coupled to a Canadian General Electric generator; the governor is of the Monneret type. Current is distributed at the generated voltage 2,080, 60 cycles, two phase. For a considerable period this plant has been running at 25 per cent. overload continuously.



Elevation of Forebay Works and No. 3 Power House

$50,000 was voted by the town of Bracebridge in 1909 for the construction of the plant at Wilson's Falls, this amount to include the cost of lands and rights. In November, 1909, contracts were let to the Canadian Contracts, Limited, of Toronto, for the construction of the dam, forebay, power house foundation and the general works; William Kennedy & Sons, Limited, to supply the hydraulic equipment, and the Canadian General Electric Co. to supply the electrical apparatus.



Horizontal plan of No. 3 Power House

Wilson's Falls occurs as the river makes a letter "S" bend over a rocky ridge. The natural head of the river is 41 feet, which is now increased to 42 feet by the dam. The dam is built at the head of the falls and is a crib framed structure loaded with stone; a long spillway will take care of the excessive floods. Stop logs, with winches for handling same, are used for maintaining the water level.

The intake portion of the headworks is situated a few hundred feet upstream and consists of a partly natural and in part an excavated canal leading into a large basin enclosed by concrete walls. These walls converge into the forebay which is directly above the power house. The forebay has one gate and feed pipe leading to the turbine. The front of the forebay has a heavy timber apron extending below the surface and also keeps considerable of the cold air out of the forebay housing. Iron racks are arranged on I-beams in front of the feed pipe mouth and special castings are used for securing them in place so that any single bar may be removed. A timber gate with a rack and pinion lift is installed and slots are left in the concrete walls to allow for placing of stop logs. An ice run is provided from the face of the rocks to the spillway. A spillway opening and a special opening for a log chute have been left in the walls adjacent to the forebay. The forebay is housed over and provision is made for heating the interior in cold weather.

The feed pipe is about 100 feet long and 7 feet in diameter with an enlarged mouth and air vent at the intake and is constructed of ¼" steel plate, the whole being supported on concrete piers with a thrust pier at the power house wall.

The turbine case and shaft are at right angles to the feed pipe in the power house and the generator is direct connected to the turbine. A twelve inch feeder is taken off the main feed pipe and carried through a gate valve directly into the exciter turbine.

The power turbine is rated at 1,100 h.p. with two 30-inch wheels at 300 r.p.m. on 41 feet effective head. The governor is of the "Riva Monneret" design, having 16,000 ft. pounds energy. An electric motor speed control device is installed for operation from the switchboard and this is to be further extended so as to allow speed control from No. 2 station two miles away.

The generator is of 600 kilowatts capacity and is designed for heavy overloading at 80 per cent. power factor. Power is two phase, 60 cycles, at 2,300 volts; the voltage allows for drop on the transmission line when running in parallel with the older plants.

The exciter unit consists of a single bronze runner turbine rated at 40 h.p. at 750 r.p.m. This unit is hand controlled. The exciter generator is a 20 k.w. interpole compound wound

125 volt machine and is designed for operation with a Tirrill regulator.

The switchboard has instruments for each phase of the generator; a field ammeter and volt meter; a voltmeter on the transmission line; synchronising apparatus and a governor speed controller. A Tirrill regulator with a line loss compensator is connected so as to maintain a constant voltage at No. 2 power house. An oil switch overload relay is placed in the generator circuit.

The transmission line into Bracebridge consists of four

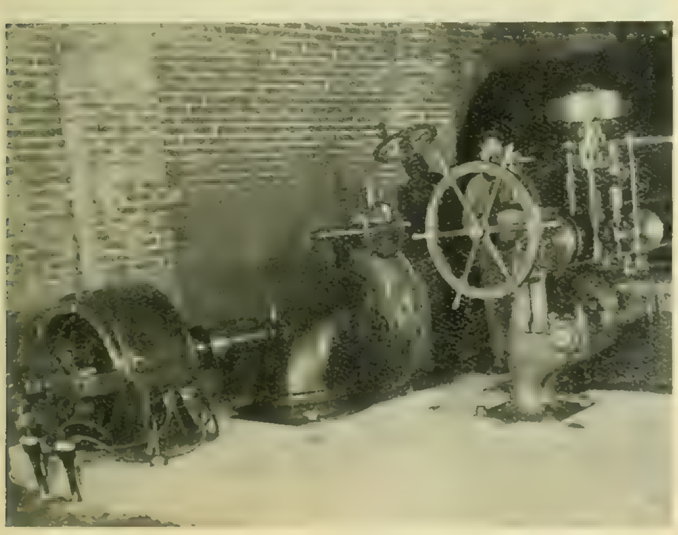
Development at Wilson's Falls—No. 3

weatherproofed aluminum cables strung on poles placed 100 feet apart with standard cross-arm construction.

The power plant is equipped with a Smart-Turner Machine Company's hand operated 5 ton travelling crane. The crane rail is carried on brick pilasters which are a part of the power house itself.

The test of the equipment showed all guarantees of operation to be well met, the equivalent of over 1,250 h.p. load being placed on the power unit and 50 h.p. load on the exciter unit.

The final figures of cost show a total of $53,000, which, with a nominal peak rating of 1,000 h.p., makes a construc-



No. 3 Power Station, Exciter Unit—Bracebridge

tion cost of $53.00 per horse power. The operation charges will be such as to allow considerable profit with power sold at the prevailing price.

If the High Falls development is proceeded with, it is proposed to make it a similar single unit plant working in parallel with the present generators.

The accompanying plans and photographs show an elevation of the forebay works and the power house and also a plan of the power house. Interior views of Numbers 1, 2 and 3 stations are shown with a comprehensive view of the Wilson's Falls forebay and power house works.

The Council in 1909 which inaugurated this latter work was headed by Mayor Armstrong, and Mr. T. S. Anderson was chairman of the committee. This year Mr. Hutchinson, who was chairman of the power committee in 1910, is Mayor, and the power and waterworks department have been placed in the hands of a commission. Mr. W. C. Simmons, Superintendent of Power, Light and Waterworks, is in a great many ways responsible for the development of the market and the notably harmonious operation of the system. Messrs. C. H. & P. H. Mitchell, of Toronto, were the engineers, Mr. C. H. Mitchell being also engineer of No. 2 plant.

Trade Publications

National Metal Molding.—Booklet issued by the National Molding Company, Pittsburg, through their Canadian agents, the Canadian General Electric Company. Descriptive of the National moldings, crosses, tees, elbows, outlet boxes, receptacles, rosettes, etc.

Conduit Talk No. 130.—By Canadian General Electric Company on type U. Conduit, an elbow with opening on the side.

Ignition Appliances and Auto Accessories.—Supply catalogue isued by Canadian General Electric Company.

1911 Diary—Canadian Westinghouse Company, Limited, have issued their usual very useful diary which contains, in addition much useful data on practical electrical matters.

The Ideal..—A booklet descriptive of a new trolley wheel of that name, being distributed by the Westinghouse Co., of Pittsburg.

Mine Telephones.—Circular No. 248, issued by the Stromberg-Carlson Telephone Company, of Rochester.

Westinghouse O. I. W. C. Transformers.—Circular No. 1079, issued by the Canadian Westinghouse Co., Limited, of Hamilton. Descriptive of their oil insulated water-cooled transformers, explaining and illustrating their internal structure, the taps, terminals, bushings, etc.

The Northern Electric Co.—A substantial and comprehensive catalogue has just been issued by the Northern Electric and Manufacturing Company, Limited, from their Montreal establishment at 814 Notre Dame street west, and contains particulars of a vast range of electrical supply articles. A useful list of tables is given at the end of the book, among these a number of discount tables. The book is bound in red boards and will stand much wear and tear.

Reynold Silent Chain.—Circular No. 6, just issued by Jones & Glassco, Montreal, Canadian agents for the Hans Renold, Limited, England, describing the Renold silent chain in connection with drives from electric motors.

Electricians' Operating and Testing Manual, by Henry C. Horstmann and Victor H. Tousley. F. J. Drake & Co., publishers, Chicago. Price $1.50. A handbook for men in charge of electrical apparatus, repair men, trouble men, lamp trimmers and electricians generally; the object of the book being to instruct the practical electrician in the management, operation and testing of the more important electrical devices now in use. Well illustrated.

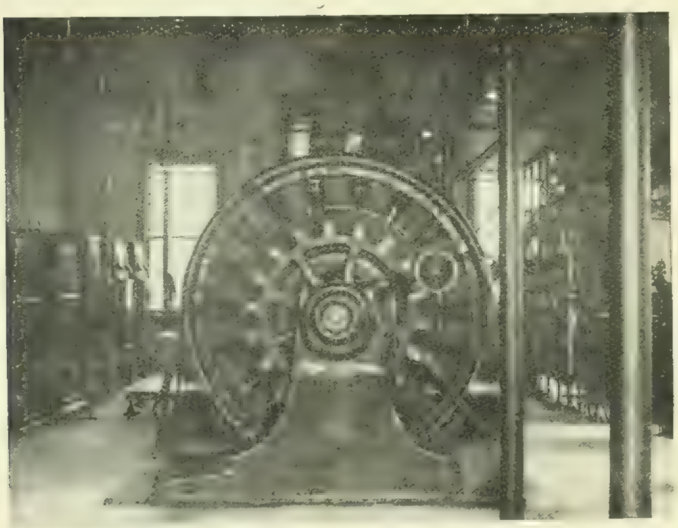
Automobile Mechanicians' Catechism, by Calvin F. Swingle, M.E. Frederic J. Drake & Co., Chicago, publishers. Price $1.25. A series of more than 400 examination questions and answers prepared expressly for the use of owners, chauffeurs, garage men and automobile machinists.

New Westminster Brilliantly Illuminated

A Series Tungsten Installation Working Satisfactorily—Double the Light at Less than Half the Cost—Will Install More of Same System

What street improvements hand-in-hand with efficient street lighting, will do for a city, is nowhere better exemplified than in the City of New Westminster, B.C., which boasts in Columbia street, its main business thoroughfare, the best appearing street in British Columbia. Not only does the city lay claim to this proud distinction, but the validity of the contention is generally conceded by visitors to the Royal City, as New Westminster, the metropolis of the Fraser Valley is called.

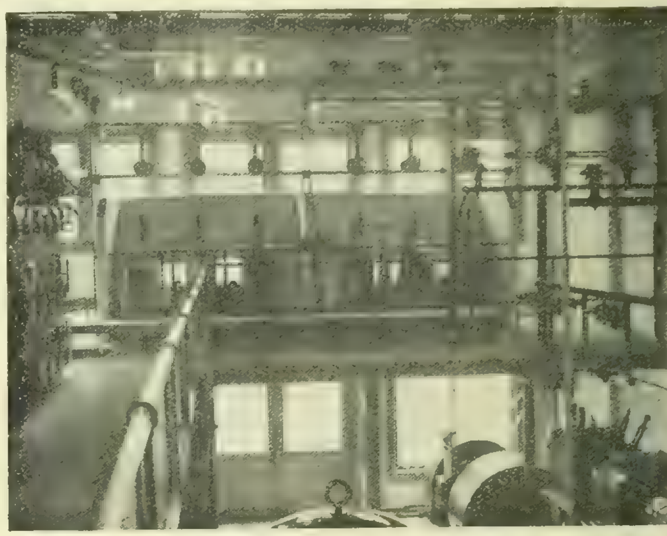
In 1908 the City Council let the contract to a well-known company for paving Columbia street and laying wide cement sidewalks. The pavement is light grey, almost white in color, and the sidewalks are finished in terra cotta shades, and as the street is 99 feet wide, the appearance is striking and pleasing. The street lighting system, is, however, the crowning glory of the street, either by day or night, and there is probably, from the standpoint of street lighting, no better lighted street in Canada by night or a finer looking street by day.



Main Floor of Station, New Westminster, B.C.

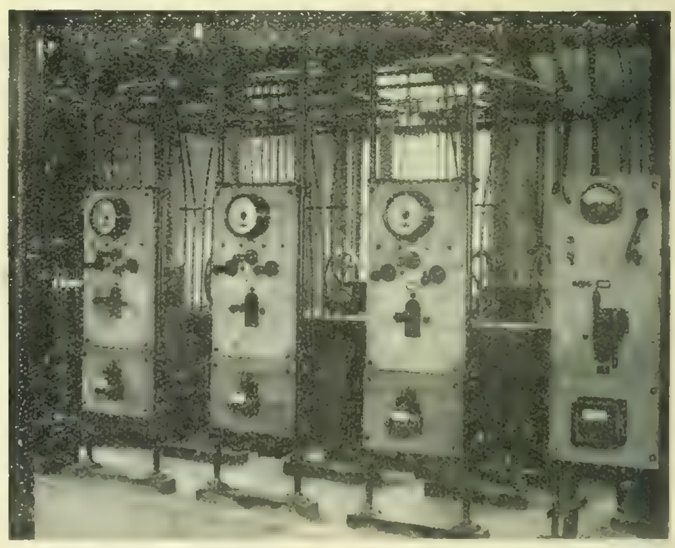
While there are doubtless other agencies responsible—for New Westminster is one of the best situated cities on the Pacific coast and offers a splendid field for investment—still, it is significant that since the street improvements have been effected, property has increased in value by leaps and bounds; that about half of the business houses and all the corner blocks, with but one or two exceptions, have changed hands, and that many new blocks and other buildings are under course of construction.

The street lighting of Columbia street presents the most interesting phase of the improvements of the past year. To begin with, unlike many other cities, the street is lighted, not at the expense of the merchants of the street, but by the city. The initial cost of installation is also borne by the city, thanks in no small measure to Alderman A. W. Gray, the efficient chairman of the lighting committee of the City Council. The system adopted was the tungsten series system, with an initial installation of 67 light poles placed 66 feet apart (99 feet apart by the width of the street) and each pole carrying five 50-watt, 7.5 ampere lamps, making a total of 200 candle power on each pole. When the entire system is installed there will be 105 poles on the street.



High Tension Side of Station, New Westminster.

Opalescent globes are used, the five globes being mounted on ornamental iron posts, fifteen feet in height, in pyramid form. The light is well diffused at night, and in the day time the number of globes, which are larger than ordinary, make a very pleasing appearance. Down the centre of the street there are also fifteen enclosed arcs on trolley brackets replacing the old enclosed lamps on the street corners.



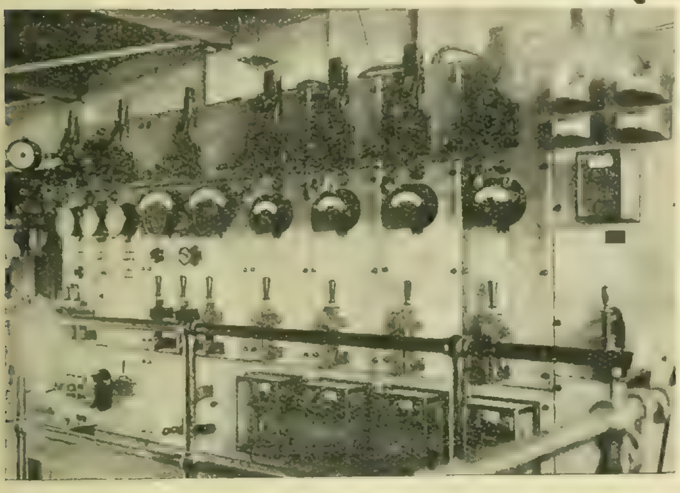
Arc Switchboards, New Westminster, B.C.

The series was designed by City Electrician P. T. Bowler, after a careful study of the systems in use in Portland, Seattle, Minneapolis and St. Paul, and is a standing monument to his ingenuity and skill.

The conduit system is laid in the cement sidewalks, lead cables being drawn through the conduits to each

lamp, which are provided with individual outlets. The total illuminating power is 28,400 candle power, 13,400 from the poles along the sidewalks and 15,000 from the centre brackets. The centre (enclosed arc) lamps are for use any time, but principally after midnight, when the tungstens are out of use.

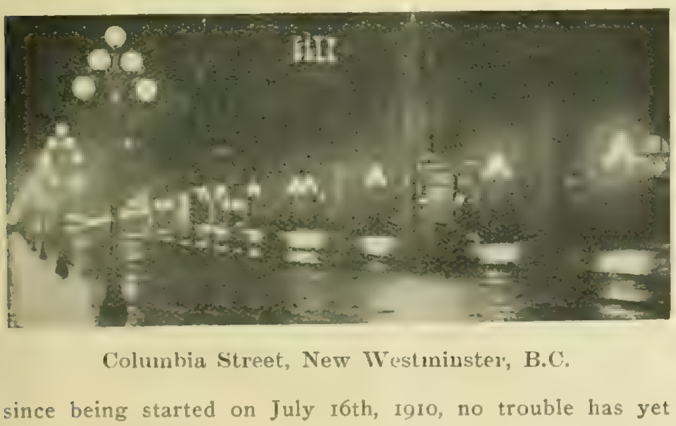
The cost of operation of this "White Way" of New Westminster is one of the most interesting features of the whole system, which took but two months to install. Electrician Bowler has calculated that the cost of five



Incandescent and Railway Board, New Westminster.

hours' operation is but $1.50 a night, counting power at about two cents per kw. The old system, with but one-half of the illuminating power, was $1.75 a night. In fact, so incredibly cheap has the cost of this new system been to New Westminster that there is talk of extending it to many other parts of the city. When current can be purchased at a cost of about two cents a kw. hour, street lighting has been reduced to a science.

At the time of installation Mr. Bowler was informed by many electricians that he would find the series system a troublesome one. His experience disproves this, for he finds it a particularly easy one to run; each lamp giving good light to the end of the life of the lamp. The current is supplied by a constant current transformer, and



Columbia Street, New Westminster, B.C.

since being started on July 16th, 1910, no trouble has yet been experienced.

The system lends itself peculiarly to ornamental street lighting, and at night Columbia street makes a striking appearance in its blaze of nearly half a thousand lights. The City Electrician has been publicly complimented by the City Council for the results he has achieved at such a slight expenditure, and has been given instructions to install more of the same system just as soon as the Columbia street extension of pavement is completed.

B. C. E. R. Co. adds Third Auxiliary Unit

The installation of the third unit of the steam auxiliary plant of the British Columbia Electric Railway Company has been completed and was placed in commission for the heavy traffic of the holiday season. This plant was described in last September's issue of the Electrical News, at which time only two 2,000 k.w. units were installed. The third unit is exactly similar to the first two described, the generator being drven by a high pressure steam turbine. All three units were supplied by the Allis-Chalmers-Bullock Co. This brings the auxiliary plant up to 6,000 kilowatts, and the record of the first two units indicates that these may be operated continuously at from 10 to 25 per cent. overload.

Mr. Allan Purvis, manager of the interurban lines of the British Columbia Electric Railway Company, has informed the president of the Burnaby Board of Trade, Mr. B. G. Walker, that the company will erect, in the near future, a fine station at Edmonds, which is situated just on the city limits in Burnaby. The station will be after the style of the one at Chilliwack, with inside waiting rooms, electric heating, etc.

Mr. C. W. Webb has resigned his position as agent at Chilliwack, for the B. C. Electric Railway Company, and Mr. W. Beer, of the Vancouver office staff, has been put in charge and will be permanently stationed in Chilliwack, with his office at the substation. Mr. Beer will attend to all inquiries regarding the installation of electric light or the installation of motors.

The copper production in British Columbia for the year 1910 is calculated at 39,000,000 pounds, as compared with 45,600,000 in 1909.

The two towers which will carry the current of the Western Canada Power Company across Pitt lake will be 160 feet in height.

The important water power development now being carried out at Jordan River, Vancouver Island, by the Vancouver Island Power Company, Limited, a subsidiary company of the B. C. Electric Railway Company, Limited, is making excellent progress, about 90 per cent. of the first installation having been completed. During the past summer an average of between 1,000 and 1,500 men have been employed. At this date, owing to the very wet weather, the force is cut down to about 300. Most of the pipe has been received and is now being placed. The majority of the electrical and hydraulic machinery is also being put in position. Owing to the weather conditions it is not expected that it will be possible to finish the first installation until well on in the spring.

The wireless station on Magdalen Islands has been completed, and the first message from there received at Pictou, Nova Scotia. Through information from the three wireless stations at Point Amour, Belle Isle, and the Magdalen Islands, it will be possible to forecast hereafter the ice conditions in the far north.

The Sangamo Electrical Company, Springfield, Ill., have just made a large shipment of integrating Mercury Flotation Watthour meters to Manilla, Phillipine Islands. Owing to the long shipping distance involved it was important that a type of meter be selected that would withstand rough usage without injury, and the Mercury Flotation Type was judged by the purchasing engineers to be particularly well adapted to meet the conditions.

Winnipeg City and the Middle West

Reports of Winnipeg's Electrical Departments—Fort Frances to have Pulp Industry—Regina Building Street Railway—Calgary's Steam Plant just Ready

The eleventh annual report of the Electrical Department of the city of Winnipeg for the year ending December 31, 1910, which has just been presented by Mr. F. A. Cambridge, City Electrician, contains much interesting detail. Among other matter the following information is gven:—

Inspection of Winnipeg buildings.—There has been a very great increase in the amount of electrical work installed and inspections made. During the year a by-law was passed making iron conduit compulsory in the wiring of the buildings in the underground area. Inspection charges are nominal and designed merely to cover the actual cost of the work; the revenue from this source for the year amounted to $5,836, of which $5,265 was paid out.

Inspection of Street Wiring.—The situation governing this work is far from satisfactory. The department has not the necessary authority and no systematic inspection of outdoor wiring has been carried out. It is hoped this matter will be dealt with at an early date in view of the coming erection of the city's system.

Fire Alarm System.—Two additional box circuits were erected, making ten in all, or a total of 83 miles of wire for this purpose, in addition to 26 miles used on the gong circuits. Two important developments of the Fire Alarm system were inaugurated during the year—connection was made with the May-Otway Automatic Fire Alarm system, by which each individual risk is connected direct to the city's office by a separate wire—also with the Dominion Messenger and Signal Company's system, which differs from the former in that all risks are connected to a central office of the Signal Company, with an operator always on duty, and from there by single line with the city service.

Municipal Electric Lighting System.—This system has now been municipally operated for ten years. During that time the number of street arc lamps has increased from 220 to 979, with an additional 753 street incandescents. In the same period the cost has been reduced from $100 to $47.75. The present scheme of street lighting by ornamental poles fed by underground circuits, to be shorty installed, is fully outlined. The report also states that they are now trying out a new street lamp which operates on direct current supplied through mercury arc rectifiers. The lamp uses electrodes of a composition of a metallic nature along with a block of copper in place of carbons. The results are said to be very satisfactory and a great improvement over the alternating enclosed lamp. During the year the total current supply received from the Winnipeg Electric Railway Co. amounted to 2,325,900 k.w.h., as compared with 209,000 k.w.h. supplied from the city waterworks plant. The cost of current from the Railway Company is .685 cents, and from the waterworks plant 2.391 cents per k.w.h.

Mr. W. G. Chace, of Smith, Kerry & Chace, resident engineer in Winnipeg during the construction of the big municipal plant there at Point du Bois, reports progress for December in part as follows:—

At Point du Bois—Power house cofferdam has been completely emptied of rock and the water has been let in. The structural steel has been practically completed for the present building. Of the power house there remains to be built yet the roof and the floors, but preparation of the forms is complete and the placing of the concrete was to begin the first week in January. The stop logs for the intake will soon be ready for use.

Generating Equipment—The fourth turbine has arrived from Sweden and word has been received of the shipment of the fifth turbine and two governors. Mr. Glassco reports from England the first generator has passed factory tests. Three of the 3,000 k.w. transformers have also passed factory tests and been shipped from Hamilton; two of them have arrived at the power house. The electric travelling cranes have been erected.

Transmission Line—Delivery of steel for these is now complete, all the insulators are on hand and final shipment of cable is reported.

Terminal Station—Walls and steel work practically complete. If floors and roof can be placed during January the work of installing the equipment can proceed at once. The transformers are about completed and are undergoing tests in the shops. The travelling crane has been received but is not yet placed.

The Ontario and Minnesota Power Company, through its President, Mr. E. W. Bachus, has written the town solicitor of Fort Frances, Mr. A. D. George, in connection with the installation of industries on the Canadian side, as follows:—

"As per our recent discussion looking to the establishment of industries at Fort Frances in the immediate future, we desire to say that we shall proceed with the installation of our pulp mill on the Fort Frances side. This mill will have a capacity of from 100 to 140 tons of ground wood pulp. We shall begin the construction of a one-machine paper mill, including all the necessary adjuncts thereto, having a capacity of 40 to 50 tons per day, as soon as we can secure a suitable site for same. This will be so arranged that a second machine can be added whenever the market tor the product will warrant."

The town council does not seem inclined to assist Mr. Bachus in a very whole-hearted way until certain out-standing differences, chief of which is the payment of arrears of taxes, can be arranged. Later reports are to the effect that Mr. Bachus is going ahead with preparations for the installation of the necessary turbines.

Regina is already making plans for the big Dominion Exhibition to be held there in August of the coming summer. A street railway to be municipally constructed and operated will be started in the early spring, and contracts for the material as asked for will open on January 31. Material for about three-quaters of a mile is already on the ground. The extent of the railway for 1911 will be about seven miles, a part of which, that connecting the centre of the city with the Exhibition grounds, is expected to be in operation by the month of June.

The power capacity, which has already been doubled within the past year, is even now quite inadequate, so rapidly is the city growing, and present plans call for additions to treble the present development. This work will be rushed forward with all possible speed to be ready for the operation of the street railway.

The City of Calgary expects to have its new power plant in Victoria Park in operation the second week in February. The apparatus already installed consists of 1,500 h.p. Babcock and Wilcox boilers, equipped with chain-grate stokers, and a 900 h.p. 300 r.p.m. 3 cylinder compound Robb engine, direct connected to a 600 k.w. Dick, Kerr & Co. street railway generator. Mr. James F. McCaul is chief engineer of the municipal power department.

A Busy Month for Electrical Quebec

Successful Annual Banquet of Electrical Association Quebec Railway Opens Delightful Pleasure Resort —Meeting of Conservation Commission

(Special Correspondent)

When the members and guests of the Electrical Association of the Province of Quebec sat down at the long tables at their second annual banquet in Montreal on January 12th, the table not only glittered with the customary white linen and shining plate, it sparkled with the iridescence reflected from hundreds of 4 c.p. bulbs with brass screws complete but filled with an amber fluid known to the elect as Mazda Cocktails. From then until the "bunghole cigars" appeared in "new type 110-16 sunlight bulbs" with the injunction "don't smoke the glass," nobody was allowed to forget that it was the electrical men's banquet. There were "moisture proof oysters—on their own bases," "short circuited croquettes," "high potential punch," "properly grounded turkey," "incandescent salad" and "underwriter coffee," besides many other familiar dishes under technical disguises. It was not at all a light affair, but there was nothing 'shocking" about it, unless it was the familiar manner in which Mr. James Bennett's name was taken in vain by the local poet laureate.

Mr. Bennett, who is the Chief Inspector of the Underwriters' Association, was introduced by the President, Mr. M. Rubenstein, as "The Grand Llama of Electricity," upon which the gleeful electricians burst into song with the following pathetic verse:

"Has anybody here seen Bennett?
B-e-n-n-e-t-t.
Anybody here seen Bennett, we long to see him smile.
If a job is bad, he makes things hum;
And he won't stand for a job that's bum.
Has anybody here seen Bennett?
Bennett with his eagle eye."

Before this effusion was thrust upon the guests by the blushing executive, vice-president Simoneau in a brief speech had proposed the toast of "Our City and Province," which had been replied to by Alderman Carter, of Montreal.

The Alderman was in a happy mood. He congratulated the President on having such a successful second annual banquet, and said the number present showed the strength and influence of such an organization. There were many professions, thousands of years old with a glorious past to look back to, but the electrical profession, although it had a great past, had a still more wonderful future. He traced the history of electricity from the days of Faraday, who sixty years ago had discovered the principles of electricity, and then continuing in ten year cycles showed the advances made since then; "1890," he said, "gave us the electric tramway, 1900 wireless telegraphy, and 1910 your first annual banquet," a compliment which elicited cheers. They could look forward, he continued, to achievements in the future surpassing anything it was at present possible to conceive. "The world is looking to you, gentlemen, to hand on to posterity the developments of this wonderful heritage. You must congratulate yourselves that you have this power placed in your hands for the benefit of future generations."

Mr. J. A. Valois then proposed the toast of "Our Guardians, the Canadian Fire Underwriters' Association," which was immediately followed by the poetic effusion mentioned above. Mr. Bennett rose and made haste to assure them that he did smile occasionally outside business hours, and he was glad of an opportunity when he could speak to them differently than he usually had to do. He briefly outlined the new arrangements which were given fully in last month's Electrical News, and said that although he considered municipal inspection was desirable, Underwriters' inspection was all that could be desired. Hitherto, the various companies had each their own view, but these views had been consolidated and every electrician knew exactly what had to be done in future. He thanked the Association for the help they had given and for their co-operation. The prime object of the new regulations was to eliminate the risk from fires through defective installations. Verdun and Westmount had embraced these regulations in their new building laws and he was sure this co-operation would work for the good of everybody concerned. Very considerable improvements had already been made and he looked forward to still further improvements. He hoped the electrical contractors would go even further and file their application for certificates directly they closed their contracts. This would facilitate matters considerably and prevent delays. Another important point he wished to impress upon them was to purchase fittings which had been passed by the Association. He warned them against listening to the blandishments of salesmen who wanted them to purchase fittings and take the chance of having them pass the inspectors. Every fitting sold in the United States could be purchased in Montreal, if it was a satisfactory one, and there was no excuse for not getting things right. He thanked the supply houses for the manner in which they had supported him and looked forward to a year of amity and prosperity.

Mr. F. J. Parsons proposed the toast of "The Electrical Jobbers and Manufacturers," to which Mr. A. W. Pilcher, of the Canadian General Electric, replied.

Mr. Pilcher minced no words, and there were times when the electricians must have thought he was getting cross with them. Having described how Westmount and Verdun had led with street lighting by being the first to adopt the magnetite arc lamps, he said that now Montreal had followed them, the district was without exception the best lighted in the world. Then he talked credit. He blamed the contractors for their laxity in granting long credit. "You give without hesitation, 30, 60, 90 days, even taking notes at six months from traders who can well afford to pay cash," he said, "and then you wonder why you do not make more money. You are slow and you must wake up. Demand cash every time, just as we have to demand cash from you. Take your discounts and look out for the hundreds of novelties by which you can make money. We have articles out of which you can make thousands of dollars and the majority of you have never seen them. We have two articles which are needed by every one of you; needed to make better jobs, less expensive jobs, and more attractive jobs and there is not one of you who carries a single one of them. Not one of you carries a line of advertising—and you expect to make money!" He emphasized the necessity for brisker business and up-to-the-minute methods.

Mr. R. Edwards, of the Northern Electric and Manufacturing Company, who met with a flattering reception, congratulated the members of the Association on their numbers. He knew many cities larger than Montreal with associations not so well supported. He considered the proportion of members to the population highly satisfactory. In a quiet graceful speech, and with the ease of the accomplished orator, he told how at one time cheapness was the only thing looked for in Montreal, but now quality

was the primary object. Other cities had passed through the same experience, but in Montreal quality now had a greater bearing on the sale of goods than anywhere else he knew.

What was the function of the jobber? he asked. First, there was the manufacturer busily creating new things. Then the contractor distributed the stock to more remote points. In order to properly recognize these spheres the different classes must co-operate. The laborer was worthy of his hire, and we were all entitled to consideration. The old saying that competition was the life of trade meant the survival of the fittest, that the weakest must go to the wall. It meant the gradual introduction of cheap and unsatisfactory work, but co-operation meant reciprocity—give and take, live and let live. It stood for the elevation of their profession, for harmony, for the success they were all looking for. Mr. Edwards sat down to a round of applause which indicated the appreciation with which his remarks had been received.

"Our Guests" was proposed by Mr. Clarence Thompson, who expressed satisfaction at the new regulations. In the past, he said, electricians had had to put up with a lot of worries and troubles, but now they were able to turn them on to the head of Mr. Bennett.

Mayor Rutherford of Westmount, and Mayor Allen of Verdun, both spoke of their municipal plants and invited the members of the Association to visit them.

Alderman Boyd, Chairman of the arbitration committee of the Association, said that it was a matter of congratulation that since the advent of the Association there had not been a single case brought before him for arbitration. It showed the harmonious spirit in which they worked. Montreal, he said, was redrafting its building bylaws and he hoped there would be an electrical expert placed upon the committee dealing with this. Montreal was growing by leaps and bounds and electricity was certain to play a great part in the city's development.

Mr. Sayer, in proposing "Our Sister Association," said that the Association had as its primary object the betterment and uplifting of their profession, and the amelioration of the conditions under which they labored. He mentioned with pride the fact of the approaching affiliation of the Association with The Builders' Exchange, and said that nothing but the greatest of good could accrue from affiliation with such a representative body.

Mr. Lauer, Secretary of the Builders' Exchange, in responding to the toast, expressed his satisfaction with the federation, and said he was sure it would work for the good of both the Builders' Exchange and the Electricians.

In speaking to "Our Association," Mr. Shaw, Treasurer, said that one of the things the association was now preparing to do was to introduce a modified form of apprenticeship in the profession which would prevent boys working with a firm for a week and then leaving and obtaining fresh positions on the statement that they were qualified. They were also negotiating with the jobbers in order that the latter would not sell to the consumer at a cost lower than the retail man was forced to charge.

Public Utilities Commission vs. Montreal Railway.

The order of the Quebec Public Utilities Commission to the Montreal Street Railway to submit full information in substantiation of their defence that "congested car traffic was owing to too few routes granted to the company," requires that such information must be in by February 1st.

The exact wording of the order is as follows.—

"It is, therefore ordered that the company submit as a basis for an enquiry a plan showing the routes in use, whether single or double track, the width of the street, schedules upon each route at various times of the day, headway allowed, number of passengers carried, particularly from six to nine a.m. and five to seven p.m., number and seating capactiy of cars employed. If it be as stated that the company has too few routes, then it is clearly its duty to show that it has applied for more, has been unable to come to an agreement with the city for additional ones and to apply to the commission for them. It would be very advisable if upon such an enquiry the company would specify such additional routes as it considers necessary and the city join issue in regard thereto in order that this important matter may receive the fullest possible consideration and be decided with the least delay."

Among the callers at the Montreal office of the Electrical News recently was Mr. J. N. Nielson, head of the firm of J. N. Nielson & Co., electrical contractors, of Pittsburg. "We have heard so much of Montreal recently," hesaid, "that I have come to look over the situation and see what the opportunities are for doing business here. I am very pleased with the appearance of the town and if events justify it I have no doubt we shall soon establish a branch office and factory here."

Both Detroit and Chicago are said to be copying Montreal's new street lighting system.

The cheapness with which metal cut-out boxes can now be manufactured and their superiority over the old style of wooden box has induced the Fire Underwriters' Association to prepare a bulletin requiring such boxes to be used in all future installations. The bulletin will be sent out about the beginning of February, after which no further wooden cut-out boxes will be permitted.

Verdun has adopted the amendment to the building by-law which requires all contractors to obtain a certificate from the Fire Underwriters' Association before they will connect their power to any premises. A similar amendment was adopted by Westmount last month.

The Shawinigan Light & Power Company has applied to the Legislature of the Province of Quebec for an act to amend its charter for the purpose of increasing its capital stock to an amount not exceeding $20,000,000.

Mr. Donald S. Barton, formerly manager Quebec Electric Light Company, has been appointed Consulting Electrical Engineer, with special duties, of the Quebec Railway, Light, Heat and Power Company. Mr. C. J. Pigot, formerly Secretary and Roadmaster of the Quebec Railway, Light & Power Co., has been appointed Chief Engineer of the same company, in succession to Mr. E. A. Evans, resigned. Mr. Pigot will have charge of all construction work (except electric) track and roadway, real estate and buildings and general engineering.

Quebec Railway, Light Heat and Power.

The Quebec Railway, Light, Heat and Power Company have given another proof of the aggressive policy being pursued by the new management in the recent expenditure of some $90,000 in extensions and improvements to the old Kent House at Montmorency Falls, which now ranks as one of the most delightful pleasure resorts either summer or winter, to be found on the continent.

From an historical point alone the spot has many charms. The house was built in 1778 by General Sir Fredric Haldimand, later Governor-General of Canada, but was purchased in 1791 by Edward Augustus, son of George III., better known under the name of Field Marshall the Duke of Kent and as the father of Queen Victoria. But the setting of this bit of antique is no less charming, for the house stands in the centre of a beautiful park overlooking the

mighty St. Lawrence river, and the famous Montmorency Falls, with their 280 foot fall, and with the romantic city of Quebec as a background.

The company has endeavored to provide the building with all the modern ideas of comfort and convenience, while at the same time conserving the original Colonial style of architecture. The accommodation has been very much increased and now includes a new ball room 55 x 33 feet, which may on occasion be used as a banquet hall, and will accommodate 250 guests. A smaller dining room will accomodate 130

The Kent House. A Beautiful Resort overlooking the famous Montmorency Falls

guests, and for small parties there are eight private dining rooms. There is also a sun room 40 by 38 feet; a cafe 40 by 20 feet, and an extensive upper balcony, as seen in the accompanying photograph, which with the various corridors of the same flat affords an opportunity for a round promenade of fully five hundred feet.

Beautiful fixtures and well distributed illumination have also been made a feature. Old colonial candle fixtures preserve the original effect of the Royal Duke's banquet hall, and the dining room plan consists of inverted alabaster saucers with oxidized brass fittings and red tassels. Throughout the effect is pleasing and restful.

Kent House is reached from Quebec city by a splendid street railway service the year round. In summer electric trains run every few minutes and even during the winter a half hour schedule is maintained. The passengers leave the cars at the foot of the falls and are then carried up an incline of nearly 300 feet by an electric elevator.

The recent extension and improvements to the Kent House have been planned and superintended by Messrs. Stavely and Stavely, architects, under the direction of Mr. C. E. A. Carr, General Manager of the Q. R. L. H. & P. Co., and executed by Mr. L. H. Peters, contractor.

The Quebec Railway, Light, Heat and Power Company is taking measurements of the head waters of the Montmorency River with a view to ascertaining the value of storage to aid their hydraulic plants during low water periods.

Meeting of Conservation Commission.

The Commission of Conservation held its second annual meeting in Quebec on January 18, 19 and 20. In his opening address the chairman of the Commission, Hon. Clifford Sifton, gave a brief review of the work of the Commission during the past year, touching on the progress of the various sections. Speaking on the subject of Canadian water powers, the chairman reiterated his opposition to the project of damming the St. Lawrence river, and referring to the probable attitude of the United States Congress, said: "It seems unlikely that the persons seeking the authority will be impowered by the United States Congress to carry out their plans without the consent of the Canadian Government. If this be correct it is quite clear that nothing will be done until full opportunity is given for a thorough discussion of the project."

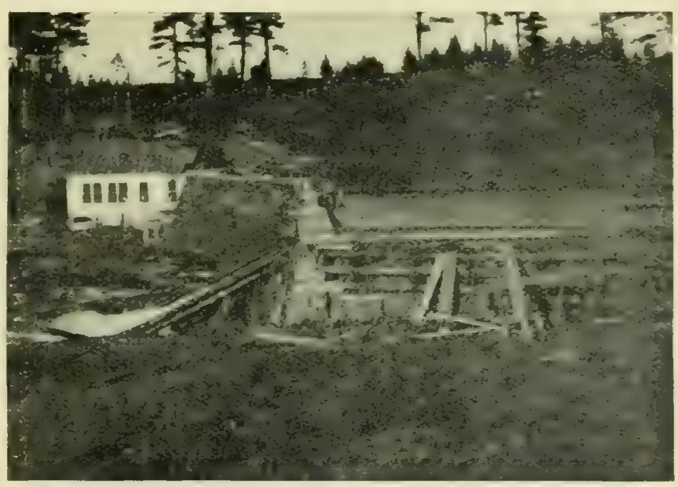
During their sitting in Quebec last month the Commission met with what lawyers are pleased to call "a nice point." A complaint was received from the residents of the lower town of Quebec that the rates on the elevator were excessive and the commission was asked to make an enquiry for the purpose of having the charges reduced.

The machinery of the law was put into action and the proprietors of the elevator called upon to supply the commission with the requisite information. This they refused to do, holding that the elevator was not a "railway" and did not therefore come under the jurisdiction of the commissioners.

Colonel Hibbard, chairman of the Utilities Commission, in an interview with the Electrical News, said that he did not care to discuss the point. "We understand," he said, "that the elevators are operated by a cable which is in turn worked by electric power and it will have to be shown at our next meeting why we have no jurisdiction over such a public utility. The burden of proof does not rest with us."

New Plant for Shediac, N. B.

The Shediac Electric Light Company, of Shediac, N.B. started up their new plant on December 1st, 1910. The equipment consists of two 18 inch Kennedy water wheels and a C. G. E. 75 k.w. 2,300 volt, 60 cycle generator. The



75 k.w. Hydro-Electric Plant for Shediac, N. B.

transmission line is 3½ miles long. The street lighting is by series tungstens with Westinghouse regulator. Forty 32 c.p. units have been installed to date. Mr. E. A. Smith is the managing director of the company.

Personal Mention

Mr. Wiliam B. Boyd has been elected to full membership of the British Institute of Electrical Engineers.

Mr. Harry Breay, of the electrical firm of Culley & Breay, was married on January 3rd in Hamilton, to Miss Jessie Wier, daughter of J. H. Wier, Hamilton. They will reside in Fort William, where Mr. Breay is manager of the Fort William branch of this firm.

Mr. William H. Browne, a prominent consulting engineer, formerly general manager of the Westinghouse interests in New York, died recently at his home in Brooklyn. Mr. Browne was well known in Canada as the manager of the Royal Electric Company before its absorption by the C. G. E. Co., and later as manager of the Montreal Light,

Interior Illumination

Low Voltage Tungsten System in a large apartment-house—Ideal distribution and low cost

The revolution in illumination that has been brought about by tungsten lamps, while due in a large measure no doubt to the fact that tungsten lamps only consume about 40 per cent. as much current as carbon lamps of the same size, is also in no less degree due to the fact that tungsten lamps lend themselves both to manufacture and operation

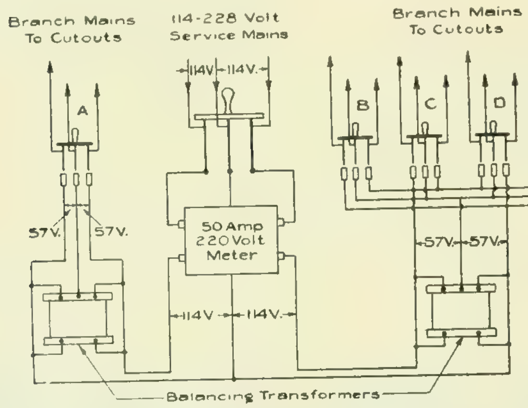


Fig. 1—Wiring plan of Royal Cecil Apartments

at low voltages, which makes possible at the same cost a larger number of smaller lighting units and so a much better effect both from an aesthetic and illuminating point of view.

The number of low voltage tungsten installations in Toronto alone is multiplying rapidly. When it was found that the 16 c.p. 110 volt tungsten lamp was proving too fragile for ordinary service the first solution was a lamp of higher power with its corresponding larger and more permanent filament. The over abundance of light of these

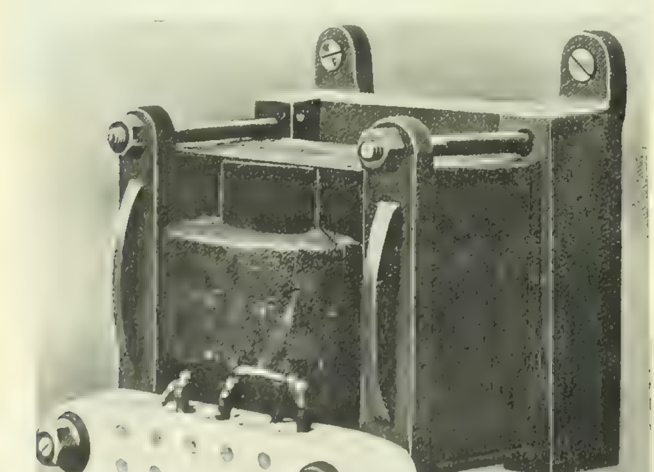


Fig. 2 Small low voltage Balancing Transformer

higher powers, for small rooms especially, has been their own undoing and they are now gradually sharing the field with smaller units of approximately 55 or 35 or even 27½ voltage requirements which are not too fragile for ordinary service and which by addition and grouping admit of such a variety in quantity of illumination that one is now able to produce, at a minimum cost, a condition of illumination that leaves little to be desired.

The former practice also of operating these low voltage lamps in series on a 110 or higher, volt circuit though in general satisfactory, is gradually being superceded by a simpler arrangement whereby a small transformer, placed inside the house, cuts the service voltage down to one-half or one-third or one-quarter, as may be required, of the leading in voltage so that the house service wires which ordinarily carry (say) 110 volts will now carry 55 or 34 or 27½, depending on the type of lamp the consumer decides to use.

A very successful low voltage lighting installation has just been completed in the Royal Cecil Apartments on Jarvis street, Toronto, a building comprising some forty odd single living rooms, in addition to public sitting rooms, music room, dining rooms, barber shop, kitchen, etc.

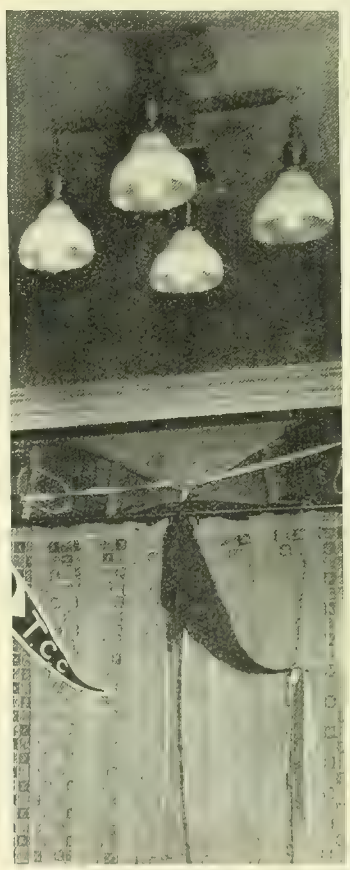


Fig. 3—Four 15 watt Lamps electrolier for living room

Fig. 4 Five unit fixture in music room

The accompanying diagram indicates the wiring plan inside the building. The load on leaving the meter is distributed as nearly as possible into two equal parts. Each section being regulated by a small balancing transformer from which a three-wire system differing in pressure by about 57 volts, as shown, serves the various rooms.

The consumption of these transformers is very small,

representing only in either case the difference between the loads on the two sides of the 3-wire system. When the load is exactly balanced no current whatever passes through the transformer.

The distribution of the load will be understood by further reference to the diagram.

Lines A feed the apartments section with 220-15 watt 57 volt lamps having a total consumption of 3300 watts.

B serves the halls with 30-15 watt units; C is the barber shop section with 20-15 watt units; D is dining room section with 40-15 watt and 20-35 watt lamps; E is the residence and reception rooms section, carrying 55-15 watt and 15-35 watt units—a total on this side of 3,400 watts.

The service mains and branch mains are all in conduit. The cut-out panels are of ¾ inch asbestos lumber. The switches are Diamond H, push, flush.

One of the chief objections to low voltage systems, that domestic apparatus, irons, toasters, etc., cannot be operated, has been readily overcome in this case by carrying the two outside service wires, between which the pressure is 114 volts, to such points in the building as there is

Fig. 5—Fourteen 35-watt Lamps in the Dining-room

likely to be any demand for the higher voltage.

The special 114 volt circuits for ironing devices, ventilating fans, etc., are on outside lines of D.

The transformer itself is shown in Fig. 2. In actual size it is about 6 inches square. In the present installation both transformers are compactly arranged close to the meter in a small enclosed cupboard which does not detract in any way from the pleasing appearance of the room.

The general appearance and effect in the various rooms is highly satisfactory. Fig. 3 shows a typical four-light electrolier carrying four 15 watt 57½ volt lamps, in alba shades. As a result of this arrangement the consumer gets the light equivalent of three 16 c.p. carbon incandescents for the operating cost of one, with the added advantage of an improved appearance and a much more even distribution of light. One single 15 watt unit also amply lights each bathroom.

Fig. 4 shows a five light fixture installed in the music room, particularly handsome in design and approaching daylight in effect in the entire absence of shadows.

In the dining room, fig. 5, full advantage has been taken of the possibilities of evenly distributing the light units. There are absolutely no shadows, and while the number of units is less than one often finds installed in a room of the same dimensions, the lamps here are only 35 watt size and yet give an illumination quite as satisfactory as one would find here in ordinary daylight.

The Royal Cecil installation was planned and installed by Mr. Thomas Jackson, 11 Sorauren avenue, Toronto, who has reason to be congratulated on his success as an illuminating enginer and expert in modern house wiring. The transformers and some of the lamps were supplied by Chapman & Walker; the fixtures by the W. C. Hunt Brassworks Co., and the majority of the lamp units by the Sunbeam Co.

Indirect Illumination popular in the West—Sixty installations in Winnipeg alone—Various types of bowl to suit all Conditions

No more convincing proof of the value of the indirect system of illumination is needed than the rapid increase of the number of installations which have been made in Winnipeg and other western points during the past year.

The first successful indirect lighting installation in the Canadian Northwest, so far as we are able to learn, was in the new office of R. G. Dunn & Co., in February, 1910. This office is 36 feet by 84 feet, 11 feet high, divided lengthwise by a series of columns into twelve bays 14 by 18, or approximately 250 square feet in area. Each bay is supplied with a 4-unit fixture containing four 60-watt clear bulb tungsten units and an X-ray concentrating type of reflector. There are no desk lamps used in the entire office, which is one of the best illuminated in the city, the illumination approximating 3.5 foot candles.

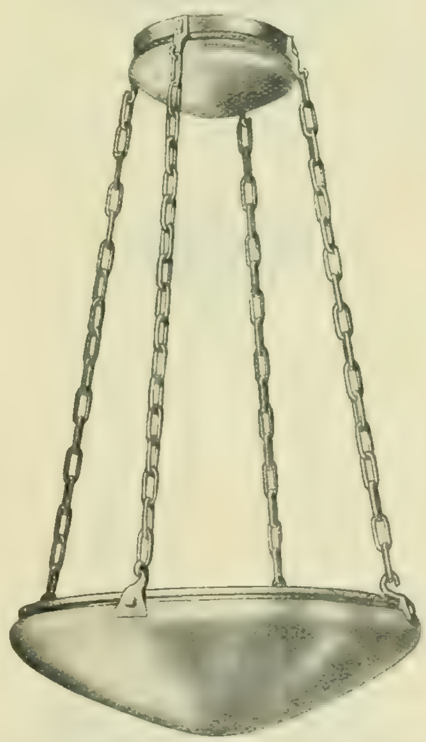


Fig. 1—A Shallow Bowl of Spun Brass

The success of this installation was quickly followed by orders from the Colonial Grocery Company, the Blue Ribbon, Limited, the Prudential Life Company, the Canadian Bank of Commerce, the Bank of Hamilton and others, including many of the best residences in Winnipeg, until the total of indirect lighting installations to date numbers more than sixty.

The Grand Trunk Pacific Railway Company have recently also become very satisfied customers and are using this type of illumination exclusively, with a specially designed fixture, in all of their new offices and stations throughout the

West. Recent installations for this company include Victoria, Vancouver, Edmonton and Saskatoon.

Figures 1, 2 and 3 represent different types of bowl used in this form of illumination. Fig. 1 is a shallow bowl of spun brass, very simple in design and is obtainable in many different finishes, such as polished brass, verde-green, dull Flemish brass, satin brass, etc. Either 40 or 60 watt lamps

Fig 2—Shallow Type Ornamental Bowl

may be used to advantage. Figure 2 represents an ornamental Grecian bowl, shallow type, and may be finished in light cream, various shades of ivory, bronze or verde-green. The maximum capacity is seven lamps of either 40 or 60

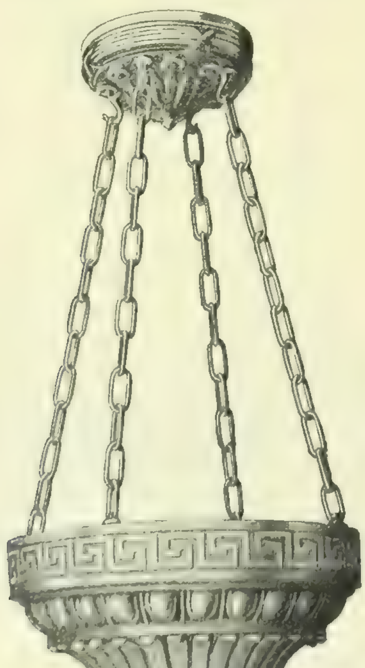


Fig. 3—Classic Bowl, deeper type

watts. This fixture is more decorative than fig. 1, and is suitable for church parlors, theatre lobbies, and large restaurants or dining rooms. Fig. 3 is a deeper type of the classic bowl and may be finished in such a way as best harmonizes with its surroundings. It is planned to accommodate one or more units, ranging from 100 watts to 250 watts each, and has a total capacity up to at least 1,000 watts. With these fixtures hotel lobbies, theatres, large halls and lodges may be efficiently illuminated.

Fig. 4 shows an installation complete. It represents the flat type of bowl suspended by decorative double chains. These blend well with the Grecian marble effect of the

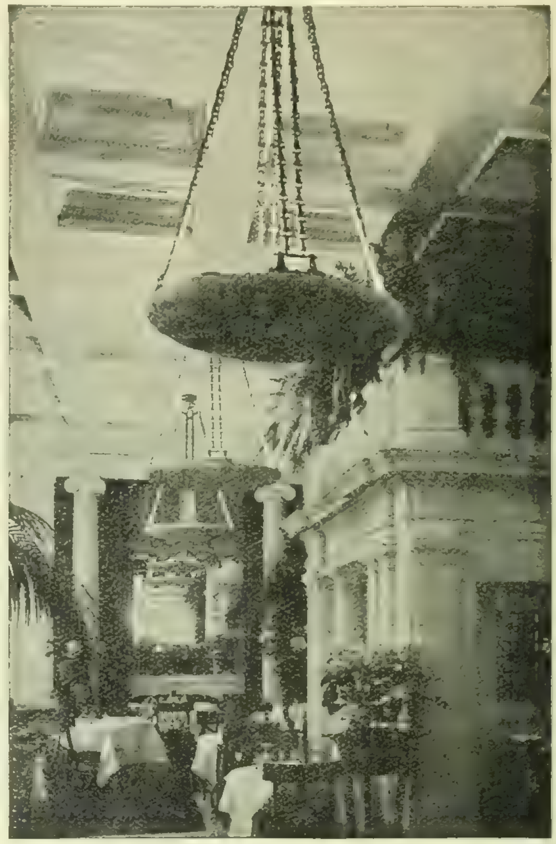


Fig. 4—Indirect Illumination of a Cafe

cafe which they illuminate. It will be noticed that the ceiling here is deeply panelled, presenting a condition very far removed from the ideal for reflection, but the illumination effect, notwithstanding, is highly satisfactory and pleasing.

The twenty-two combined compartment sleeping and observation cars, which were recently equipped with electric lights by the Canadian Pacific Railway, have proved such a success that it is the intention of the company to further extend the use of this improved electric lighting system. It will be applied to the sleeping, dining and parlor cars now being constructed at the Angus shops, for the coming year's equipment. The apparatus used is the Stone system, which consists of a dynamo driven by a belt over a driving pulley on one of the truck axles of each car, as recently discussed in the Electrical News. Two sets of storage batteries are used, which charge or discharge as the load varies, which prevent any accidental failure of the light. The lighting arrangements on these cars have been very carefully studied to provide ample light for reading in every part of the car, without any intense glare being apparent to the eye.

The Columbia Metal Box Co., New York, announce that they have moved into their new five-storey and basement factory building at 226-228 East 144th street, and that the growing demands for their materials have forced them to more than double their equipment.

Telephone News of Canada

A Successful Automatic System.

The remarkable development of the business of the Canadian Machine Telephone Company in the city of Brantford, its extension and connection with the network of telephones controlled by independent companies in the southern counties and its expansion to the several thriving agricultural communities in the counties of Brant, Norfolk and Haldimand, is shown in some measure by the accompanying drawing which indicates that this system, with its connections, covers with an efficient network of telephone lines practically the whole area lying between Otterville and Langton on the west, Canfield and Rainham on the east, Lake Erie on the south and stretching away beyond Brantford as far as St. George to the north.

It must be remembered, too, that this is the work of only 18 months, for it was just that length of time ago that the Lorimer system of automatically operated telephones

The Brantford Automatic System and its Feeder

commenced operations in Brantford. To-day there are between 800 and 850 automatic telephones in use in the city, in addition to approximately another 300 in the outlying towns.

The advantage of co-operation between the various contiguous independent companies is also seen in this map. At the present stage the independent systems can boast no long distance lines like the Bell Company and the more isolated an independent plant is, the more curtailed the usefulness of a telephone. In this district, however, co-operation between the various companies has resulted in the building up of what is practically a long distance service to 99 per cent. of the users.

Further, this company expects in a few weeks to complete connection with the independent company in Ingersoll with about 800 subscribers in that district. This will give connection with the independent lines farther west, as far as St. Thomas, including in all about 2,000 additonal subscribers. This will add materially to Brantford's outside service and indicates the progress the independents are making in rural districts, where no telephone service previously existed.

The rapid increase in numbers is probably the best testimonial the Canadian Machine Company can ask of the satisfactory service being given by its automatic system. It is said, however, that subscribers are very free to express their appreciation of its various features, such as distinct articulation, no calls to answer a wrong number, no cutting in on important conservations and the absence of many other little annoyances so often experienced with a poorly operated manual system. To all appearance this system has come to stay and will doubtless be found in the near future, now that it has shown itself, not a clever toy, but a public utility of the highest order, spreading its influence in every quarter of the Dominion.

Yarmouth Telephone System.

American Consul A. J. Fleming, writing from Yarmouth, Nova Scotia, says:—

The Yarmouth telephone system, which up to two years ago gave an inadequate service, is now a part of the Nova Scotia company, with headquarters at Halifax, and operates more than 400 telephones in Yarmouth. About fifty farmers living within ten miles of the city have also installed telephones, and exchange stations have been established at seven towns in the district, covering 100 miles of wire and having in each place 6 to 52 telephones, making a grand total of 620 telephones in the Yarmouth system.

In the local system there are now 1,070 miles of wire, of which 327 miles are inner cable, 192 miles underground cable, 105 miles aerial wire, and a large quantity duct underground wire. There is considerable ordinary pole wiring, most of which is on the farmers' lines and in the outskirts of the city, but which is gradually giving way to cables.

The local manager states that the cost of the system averages from $150 to $175 per mile, completed and ready for operation. There are altogether fifty employees of the system, including operators, linemen, superintendents, and electricians. Operators (girls) are paid $15 to $25 per month; linemen, $30 to $40; and extra men, $60 to $75.

Nearly all the wire used comes from England; some from the United States. A considerable number of the appliances come from the United States. Few institutions in this part of the Province have increased as has the telephone service, and the company is extending, enlarging, and improving its system, making every endeavor to keep abreast of the times in improvements and modern appliances.

Bell Telephone Changes.

The following internal changes took place in the Montreal offices of the Bell Telephone Company on January 1st, causing the operations of the company to be conducted by two departments, the Operating Department and the Plant Department. The Operating Department under the direction of the General Superintendent, now takes charge of all matters pertaining to the securing of business, collection and accounting of revenue, relations with the public and the operations of the exchanges and lines of the company. The Plant Department, under the direction of the General Superintendent, takes charge of the construction and maintenance of all outside plans, installation and maintenance of subscribers' equipment, the maintenance of all switchboards, except those installed by the manufacturer. This department will also take charge of the company's real estate, with the exception of the Head Office building in Montreal and

the Adelaide street building in Toronto, and the Supply Department premises.

Mr. D. Crozier, of Merrickville, a lockmaster on the Rideau canal, has a telephone fitted in his house, and the Bell Telephone Company agreed to give him connection with Burritt's Rapids and Kilmarnock for $15 a year. The telephone has been in some time, and the contract had been carried out, but last August the connection with the two places in question was cut off, and Mr. Crozier was told that as his was the only telephone in Merrickville with outside connection it did not pay to operate it. Mr. Crozier took the matter to the Railway Commission, and the company was ordered to put in the connection again until the expiration of the contract, which is next April 30th. Chairman Mabee ruling that if the agent of the company entered into this contract it must be observed.

Following the recent judgment of Chairman Mabee, of the Dominion Railway Commission, that the Bell Telephone Company must give the same rates to all parts of the city of Toronto, the citizens of Ahuntsic, a newly annexed section of Montreal, have petitioned the Bell Company for the same rates as is charged in the older city.

Telephone Supplies for China.

The Daily Consular and Trade Reports contain the following reference to telephone conditions in China:—

"An American, just from Peking, informs me that a member of the Yu Ch'uan Pu (Board of Communications), which controls the telephone system, expressed himself enthusiastically in favor of telephone extension in China, and said that he believed that every city of sufficient magnitude within the Empire would possess telephone facilities within a very few years. It need hardly be suggested that American manufacturers who are not already in touch with the Board of Communications should send representatives to Peking. I am strongly impressed with the possibilities of the market for telephones in north China."

Progress in the West.

The annual report of the Alberta Government telephones has just been made public, and shows an increase of 568 telephones over last year or about 33 per cent. The revenue increase is $11,041. Branch exchanges will be installed in Edmonton and Calgary.

Beginning with the present month, the British Columbia Telephone Company will commence the publication of a monthly magazine covering the territory in which it operates in British Columbia. The publication will be a sixteen-page one devoted particularly to the interests of the employees but at the same time dealing with the telephone business in general.

Mr. C. H. Sears, the manager of the Chilliwack Telephone Co., has been appointed by the city of Chilliwack as inspector of electric wiring. He has also consented to act for the British Columbia Electric Railway Company as their inspector for the township until such time as an official is appointed by the rural council. No connection will be made in future by the B. C. Electric Company for lights until a certificate of inspection has been presented to the company.

The better to enable the British Columbia Telephone Company to lay its new paper pupin coil cable from Vancouver to Victoria, and for the purpose of making prompt repairs to any future breaks in the Gulf of Georgia and Fraser River cables, the company has just decided on the construction of a cable ship. The equipment is to be secured in England, while the hull will be built in Vancouver. The vessel will be about 125 feet in length, being somewhat smaller than the Restorer. The total cost of the ship will approximate $35,000.

The experiment made by the Canadian Pacific Railway in train dispatching by telephone has proved so satisfactory that a further 2,000 miles of track is to be fitted with telephones for this purpose, making a total of 4,254 miles in operation.

A company of ten prominent Arrow Lakes ranchers and merchants has been formed for the purpose of operating a telephone service between Arrowhead and Robson. Application for articles of incorporation have already been made and details of the proposed scheme will be announced later. Such a telephone line, if built, would prove of immense advantage to settlers living between the two points, and the men forming the company have reason to believe the enterprise would prove a financial success.

The city of Edmonton will spend $130,000 during 1911 in telephone extensions and improvements.

An important work undertaken by the Dominion Government in British Columbia has just been completed in the closing of the final link in the iron circle of the Kamloops-Okanagan telephone system by the construction of a new telephone line between Kamloops and Vernon by way of Grand Prairie. In its completed state the government telephone line now runs in a full circle from Kamloops through Nicola, Hedley, Penticton, Kelowna and Vernon back to Kamloops, with these six offices acting as connecting points. In addition there are three spurs, Kamloops to Little Fort Nicola to Lower Nicola and Vernon to Lumby.

A special committee appointed by the City Council of Vancouver to look into the desirability of establishing a dual system of telephones, the competing system in all probability to be of the automatic type, has reported against the advisability of a competing system.

Miscellaneous.

Rumors are afloat of an important telephone and telegraph merger. The American Telephone and Telegraph Company, who recently obtained a controlling interest in the Western Union Cable Co., and were already the virtual proprietors of the American section of the Bell Telephone Co., are now reported to be after the Anglo-American Telegraph Company. A director of the latter company recently left Montreal after a visit to inspect the Canadian property and negotiations are to be transferred from London to New York, where an important meeting was held on January 17. It is expected that even if a merger is not the immediate result of this meeting, a working arrangement will be arrived at.

Mr. S. S. Dickenson, General Superintendent of the Commercial Cable Company, died recently at his home in New York. Mr. Dickenson was widely known throughout Nova Scotia, and the news of his death comes as a shock to a host of friends and acquaintances. He had been ailing for a year or more, though able to attend to his office duties until very recently.

The Telegraphone Company has opened offices in Montreal for the exploitation of their machine, an adaptation of the phonograph idea based on the discovery of Professor Polsen, of Copenhagen, that electricity magnifies

in points only and does not spread. The machine consists of a dynamo driving two drums upon which is wound a highly tempered steel wire. This wire passes between two small magnets which when placed in the field of a telephone circuit receive the current vibrations and correspondingly magnetize the wire. On the wire being returned through the magnets the reverse process comes into operation and every variation of the voice can be heard over the 'phone. These records can be kept indefinitely or used repeatedly, as fresh sound vibrations appear to totally destroy any previous magnetism. The machine is at present manufactured in the United States, but it is proposed later to manufacture in Canada also.

A submarine telephone cable has been laid between Dover and Cape Grinez similar to the one which traverses Lake Constance. The efficiency of the cable is increased by loading coils at intervals of one mile. These coils reduce the distortion of the current impulses and make the spoken sounds more distinct.

The Marconi Wireless Telegraph Company's new station at Port Arthur is completed and in working order and commercial messages will now be accepted. It was operated for the first time December 17, and several congratulatory messages were exchanged between local citizens and residents of other towns which have wireless stations, principally Duluth. Mayor Matthews, of Port Arthur, sent greetings to the Mayor of Duluth.

The Town Council of New Liskeard has signed a petition to the Provincial Government, asking the Province to buy out the Bell Telephone system and operate it as a public service. This petition was submitted by the Municipal Union of the Province.

The Michigan Central has decided to follow the example set by the C. P. R. and Grand Trunk railways, and equipment has been ordered for a telephone line between Windsor and St. Thomas, and it is understood that the line will be extended to London.

The new year in Prince Edward Island was celebrated by the opening of telephone communication between the Island and the mainland. It is now possible to telephone from Charlottetown to Pictou, Sydney, Halifax, Windsor and Amherst. It is understood the new cable will be used for the common purpose of telephone and telegraph service. The company is known as the Prince Edward Island Telephone Company. Mr. H. J. Palmer is president, and Mr. Walter Grant, manager for the province.

The sixth annual meeting of the pioneer telephone company in West Elgin, the Wallacetown and Lake Shore Telephone Company, was held recently in Wallacetown, when a very satisfactory report was presented. There remained on hand after all debts had been paid, $698.28. The usual 6 per cent. dividend was declared. The following officers were elected for 1911: President, Jas. Lunn, Port Talbot; Vice-president, Irenum Shipley, Wallacetown; Secretary-Treasurer, Jas. Bobier, Wallacetown; Directors, W. H. Bole, West Lorne, and H. V. Sutherland, Fingal.

A bill is being discussed in Washington which amends the Burton Law to the extent of allowing an additional diversion, not exceeding 20,000 cubic feet a second from the Niagara River above the falls. The bill also would do away with the restriction of import of power from the Canadian side.

Industrial Notes

Belliss & Marcom Steam Turbines

Messrs. Belliss & Morcom, Engineers, of Birmingham, who have within the last few years introduced a steam turbine of their own design, report very successful progress with it. Within the last few weeks they have secured an important order from the Birmingham Corporation Electricity Supply Department for eight 1,000 k.w. Belliss exhaust steam turbines running at 1,500 r.p.m. to work in conjunction with a similar number of Belliss 1,500 k.w. reciprocating engines in the Summer Lane Station, Birmingham. These exhaust turbines will run in parallel with the alternating current reciprocating sets in the station. Repeat orders have also recently been received for Belliss high pressure steam turbines from the Aston Manor Corporation and from the City of Johannesburg in South Africa, the latter of 3,000 k.w. capacity. Messrs. Laurie & Lamb, Board of Trade Building, Montreal, are Canadian agents for this firm.

New Two-Wire Plug Cutouts

A new two-wire line of Edison plug cutouts have been designed by the Duncan Electrical Co., Ltd., of Montreal, the principal features of which are that the shipping weight is about ten per cent. lighter, yet they are stronger on account of the better distribution of the porcelain. Provision is made by one elongated hole for the retaining screws in order to relieve the strain and permit of better adjustment, preventing the rocking of the cutout on its seat. The design is such that 1/8" air space is allowed underneath and the main body rests on spots so adjusted as to give a firm position. The wiring features have been taken care of, and an easier method of introducing the wires are provided for. The porcelains are clean cut and in all is a workmanlike product. Other new and interesting lines are under way, and will soon be marketed by this young and progressive firm.

Will Operate Outside Underwriters' Association

The newest insurance company, The Provincial, of Bolton, England, has established a branch and commenced business in Canada on January 1st. This company was founded towards the end of 1903 with a nominal capital of $250,000, of which $150,000 was subscribed and $375,000 paid up. The business has been under the chairmanship of Sir James W. Scott, bart., a well-known North of England cotton man, and while carrying all the usual risks of fire, burglary, accident and guarantee, has proceeded strictly on the lines of selection rather than building up a large premium income. It will be operated in Canada outside the Canadian Underwriters' Association, Messrs. Willis Faber and Company, of Canada, Ltd., being the representatives.

New Offices for National X-Ray Company

The National X-Ray Reflector Co., of Chicago, announce the removal of their general offices and display salesrooms, owing to the necessity of securing larger quarters, to the ground floor of the new Brook's Building, corner Jackson Boulevard and Franklin street.

Canadian Tungsten Movements

Mr. W. T. Grose, the Montreal Manager for the Canadian Tungsten Lamp Co., has been for some time laid up with la grippe. He is now about again and is on his trip east.

Mr. A. L. Woolf, special representative of the Canadian Tungsten Lamp Co., spent the Christmas holidays in New York, and left on the 15th inst. for Halifax and the far east.

Jones & Glassco Company Pamphlet

Jones & Glassco have published an interesting little pamphlet giving approximate comparative costs of electric power using belt and chain drive. In a list of Canadian towns given, the saving per useful horse power per year by using chain instead of belt varies all the way from $2.42 up to $12.38. In this comparison it is pointed out that the calculations are based on the maximum efficiency (80 per cent.) of belt drive, but the minimum efficiency (95 per cent.) of chain drive.

Weston Instruments for Toronto Hydro

The Toronto Hydro-Electric system has accepted the Weston Electrical Instrument Company's tender for alternating current switchboard instruments for the new substations in Toronto. These instruments are an entirely new product of the Weston Electrical Instrument Co., and represent in each case a distinct improvement over any existing types. They are dead beat, extremely sensitive and possess a high degree of accuracy. Mr. A. H. W. Joyner is the Toronto representative of the Weston Electrical Instrument Company.

Le Valley Vitae Carbon Brush

The Electrical Maintenance & Repairs Co., Toronto, are now handling the celebrated Le Valley Vitae Carbon Brush for motors and dynamos, for which they claim many points of superiority over any other brush on the market. With the very highest grade of carbon procurable under the most scientific processes, is compressed a lubricant of very low resistance and of such a nature that it prevents excessive wear of the commutator, giving a high conductivity and running cool and nsoiseless. The resistance of the brush lengthwise and across the width is low, but through the thickness is comparatively high. This has the effect of eliminating the sparking of the bars under short circuit by the brush. Brushes of this carbon give the commutator that smooth, glossy, hard bronze finish so desired by all experienced engineers, which is practically indestructible when once acquired. A full stock of this brush is carried by the above firm in sheets of the different thicknesses, from which brushes are cut to order.

Miscellaneous

The Radiant Electric Co. are working on a new design for a complete electric range which a large apartment house in Western Canada proposes to install. If a satisfactory design can be procured the order will be a large one, probably in the neighborhood of 100 units.

The Ontario Hydro-Electric Commission have placed an additional order for about 40 car loads of red cedar poles with the Western Lumber and Pole Company, of Denver, Colo.

A report concerning the destruction of forest moths by electric lights and certain machines, as conducted in Zittau, Saxony, in August, 1910, has been received. This report says that the destruction of the moths by electric lights, as conducted at Zittau, can not be recommended as a complete success.

Prof. Dugald C. Jackson, of the Massachusetts Institute of Technology, expert adviser of the Massachusetts Highway Commission in telephone matters, and President of the American Institute of Electrical Engineers, has been retained by the British Government to advise the Postmaster-General in regard to the value of the great telephone property which the Government is this year to purchase from the operating companies and make a part of the national Postoffice organization. Prof. Jackson sailed for England on January 18 by the steamship Lusitania, for a week's conference with the Postmaster-General.

The Canada Gazette announces the issue of letters patent incorporating the National Hydro-Electric Company for the purpose of carrying on an electric light, heat and power business in all its branches, in Montreal.

The New Zealand Government have decided to develop the principal water powers of the Dominion. To this end, the sum of £500,000 ($2,500,000) has been appropriated by Parliament—£300,000 ($1,500,000) appears in the estimates for immediate construction work. When tenders are invited our Trade Commissioner will endeavor to secure particulars so that Canadian manufacturers may have an opportunity of tendering.

Guelph Street Lighting

It is intended to light the streets entirely by means of multiple lamps, and 100 watt lamps will likely be used throughout. Tungsten arcs are used at prominent intersections. For general illumination brackets carrying Wheeler radial wave reflectors are used. On the main business street multiple arms are being designed to carry 100 watt tungsten lamps in opaque glass balls. These will likely be mounted on the trolley poles and provided with a satisfactory spring suspension for the lamps. The lamp circuits are controlled by series solenoid switches specially designed for the purpose and operated through the old series arc circuit.

Power Rates

The rates for Guelph have been fixed as follows:—

1. $1.00 per month per h.p. of rating or demand.

2. Meter rate on all energy consumed up to 150 k.w. hours per h.p. of rating or demand as above, as follows:—

Up to 10 h.p., 1⅛c. per unit.
11-40 h.p., 1c. per unit.
41-100 h.p., ⅞c. per unit.
101 up, ¾c. per unit.

3. Meter rate of 2-5c. per unit on all energy consumed over 150 k.w. hours per h.p. of rating or demand (150 k.w. hours equals 8 hours use of each h.p.)

This will bring the price of power to the consumer, depending on amount taken, from $22 to $35 per h.p. per annum.

Ten per cent. discount is allowed for prompt payment on all accounts.

A New Engineering Firm

Mr. M. B. Logan has recently severed his connection with Siemens Bros. Dynamo Works, Ltd., and has opened up offices with Mr. C. T. Bowring as Consulting Engineer under the name of Bowring & Logan, at 34 Victoria street, Toronto. Mr. Logan, who is well known in Toronto, has for a number of years been connected with Siemens Bros., both in Europe and Canada. Mr. Bowring has had long experience in the United States with the Westinghouse Electric & Manufacturing Co., and been identified with a large number of their installations.

Preparations to prosecute the electrical trust, which the Department of Justice characterizes as the "greatest trust in the world,' have been completed by Attorney-General Wickersham, of the United States Government. The first suit, it is said, will be aimed at the Association of Licensed Manufacturers of Incandescent Electric Lamps, the principal component parts of which are the General Electric and the Westinghouse Companies and the National Electric Lamp Company, which is controlled by the General Electric.

QUESTIONS AND ANSWERS

GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS:

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.
4. To avoid trouble and unnecessary delay, correspondents should state their questions clearly, so that there can be no possible doubt as to the information required.
5. In all cases the names of our correspondents will be treated confidentially.

Theory of the Compensated Wattmeter.

Q.—Would you please explain to me the theory and connections of the compensated wattmeter?

A.—This type of instrument, which is made, so far as we are aware, only by the Weston Co., is one arranged so that it gives a true indication even when connected so that it is measuring the consumption of its own potential circuit as well as the true load. This is a very handy feature, as occasionally it is inconvenient or undesirable to connect the shunt coil of the meter in front of its current coil, as for instance when there is a considerable drop between the load and the point where the wattmeter is connected in. If the potential be taken off at this latter point the wattmeter reads high to an amount depending on the drop, while on the other hand, if taken off at the load, the wattmeter reads high, unless compensated by the amount of its shunt circuit current. The error may or may not amount to anything appreciable, depending on the relative values of the load and potential circuit currents.

This compensation is provided by a small coil, in series with the potential circuit, but wound turn for turn alongside of, and connected opposite to, the series field. This obviously compensates for the shunt current in the series field, and so the instrument reads correctly even when measuring its own shunt consumption. For use when connected in the ordinary way, that is, with its shunt in front of its current coil, these meters are provided with a third shunt terminal, which is tapped into the shunt circuit just in front of the turns that are wound with the series field, a small resistance being connected in series with it, to compensate for the resistance of these turns, as they are cut out of circuit when the third binding post is used.

Instruments of D'Arsonval Type.

Q.—What is the D'Arsonval type of instrument?

A.—It is an instrument employing the D'Arsonval principle, which is that of a pivoted coil arranged within the omission poles of a permanent magnet so that the coil turns to one position or another as more or less current is put through it. It is employed in the majority of direct current indicating instruments, but obviously it is not suitable for alternating current work, as in that case the coil would either keep up a continuous swinging movement from one side to the other, in an endeavor to follow the alternations of the current, or else there would be no movement whatever. The name comes from that of a French scientist, D'Arsonval, who first employed the principle when designing the galvanometer which bears his name.

Opposite Effect of Increased Field on Motor and Meter.

Q.—Why is it that a shunt wound direct current motor slows down with increase of field strength, whereas a direct current commutating meter speeds up as the field strength increases. This type of meter is but a small direct current motor, so why should the two not behave in the same way?

A.—The direct motor tends to speed up with an increase of field strength, due to the greater pull exerted between the armature current and the stronger field. At the same time the stronger field produces a greater counter E. M. F., which in turn reduces the armature current, this lessened current naturally exerting a smaller pull on the field. The result of this is that the motor tends to slow down, and as the latter force is greater than the one tending to speed up the motor, the net result is a reduction in speed with increase of field strength.

In a commutating meter an increase of field strength produces practically no change in the counter E. M. F. of the armature, because there is practically no counter E. M. F. present in a meter armature, nearly all the potential of the circuit being expended on the resistance which is in series with the armature. This being the case, there is no speed reducing tendency present, and as the meter tends to speed up, just as in the case of the motor, because of the stronger pull between the strengthened field and the armature, the net result is faster speed with a stronger field, and vice versa.

It should be noted that the motors and the meter differ in another important particular, and that is, that in the former the field is energized by the potential, the armature carrying the series current, whereas in a meter it is just the other way round.

Effect on Second Motor When Street Car Wheels Slips.

Q.—When one of the wheels of a street car starts to slip, does it put more load on the other motor?

A.—It all depends whether the motors are operating in series or in parallel. If the former, the slipping of one motor lessens the load on the other, because the increased speed of the former creates a much larger counter E. M. F. than the two motors were formerly producing, and hence the current drops. Obviously, when the motors are in series, the current is the same in both, and so the slipping of either or both motors, when they are in series, means a reduction in the load of both.

The contrary is the case when the motors are in parallel, as a slippage in one means that it ceases to do its share of the work, and as there is no connection between the two counter E. M. F's., the load on the other goes up.

What is an Acyclic Generator?

Q.—Would you please tell me what an acyclic generator is.

A.—An acyclic generator is primarily one which produces nothing but direct current, that is, the currents in the armature are always in the one direction, as distinguished from the ordinary direct current machine, which generates alternating current in the armature, but rectifies it by means of a commutator before it is delivered in the line. The acyclic machine produces uni-directorial current in its armature conductors by means of having all field poles of one polarity, the shaft being used as a magnetic return. As the voltage generated in each conductor must necessarily be low, the generator has to be equipped with a number of slip rings and brushes, so as to send the current through one conductor after the other, and thus build up the voltage to the desired point. These rings are of course quite a complication, but they have the advantage of allowing one to readily change the voltage of a machine by connecting the coils in different series-parallel combinations. Also, varying potentials can be obtained from the same machine by tapping from different rings. We do not know that this type of machine has been developed commercially to any great extent, though some have been built for steam turbine drive, the absence of a commutator having certain advantages in this class of work.

An Up-to-date Canadian Manufacturing Laboratory. No expense spared in Equipment

The laboratory that has been fitted up by the Canadian Tungsten Lamp Company for their factory in Hamilton, is the evolution of years of experience and the result of large observation, and the efficient chemist, under whose supervision the laboratory has been arranged, has succeeded in equipping the factory with what is perhaps not the largest, but which is a thoroughly up-to-date and workmanlike installation. Mr. Harry Crerar, the electrical superintendent, who spent nearly a year visiting the most important lamp factories in Europe, has also been responsible for much of the arrangement in this laboratory.

Realizing the difficulties of obtaining on this continent the services of a chemist thoroughly experienced in the construction of tungsten filaments, the Canadian Tungsten Lamp Company secured the services of Dr. Walter Tritsch to come to Hamilton and take charge of this department. Dr. Tritsch is a graduate of Zurich University, subsequently taking a post-graduate course in Karlsrube University, where he spent several years in chemical researches. He also has had a wide experience in many celebrated laboratories working on electro-chemical and physical-chemical experiments and studying the molecular state of elements, especially in

Fig. 1

reference to reducing elements to a kolloidal state. He was lately associated in Vienna with Dr. Hans Kuzel, the original inventor of tungsten filaments and the patentee of some hundreds of processes, practically no tungsten lamp being made anywhere in the world to-day without using some of Dr. Kuzel's patents. This personal association was particularly fortunate as the Canadian Tungsten Lamp Company manufacture their "Kolloid-Wolfram" Lamps entirely under Dr. Hans Kuzel's patents. Cleanliness is one of the first essentials; walls and ceilings are dust-proof and finished in the hardest varnish. Tables and benches are all selected of hardwood and built to special designs.

Fig. 1 shows a portion of the analytical laboratory and some of the many and divers apparatus in use. Here the doctor and his assistants are continually experimenting and testing titanium, tungsten, iridium, uranium and other rare metals and various alloys to further perfect and toughen what was at first considered a fragile filament. Here are installed all kinds of retorts, testing coils, etc., Dr. Graphine's electrical ovens and also electrical furnaces, made under the designs of Herr Jaschke, and, in fact, almost every known apparatus for testing chemicals and metals. The equipment

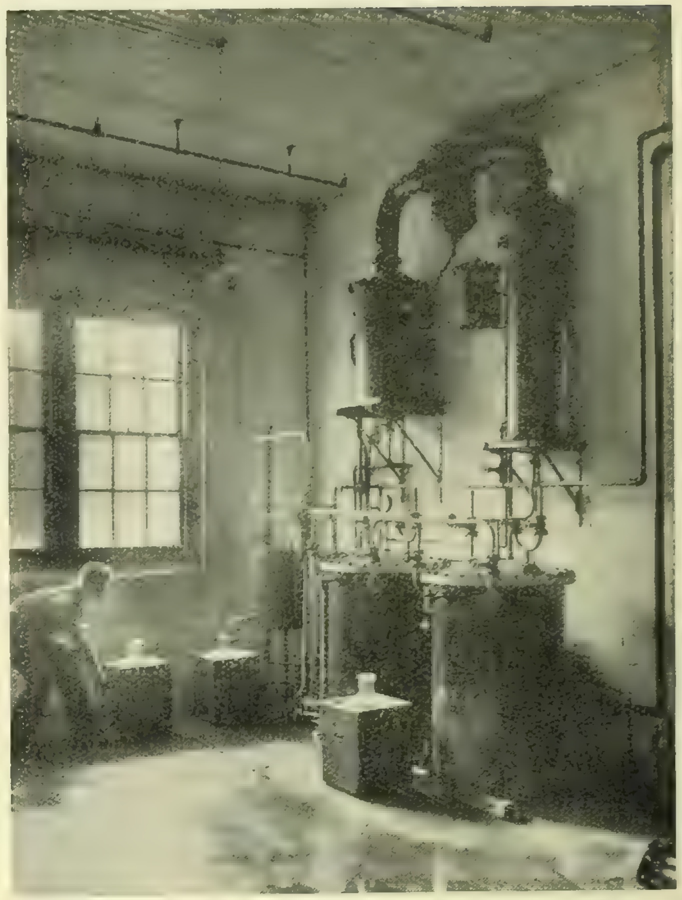


Fig. 2

in this part of the laboratory is without doubt one of the finest in Canada. It is piped for hydrogen, nitrogen, ammonia, natural and artificial gases, distilled as well as city water, all of which can be secured by the chemist at a moment's notice by simply turning a tap.

Fig. 2 shows the large distilling plant which furnishes water of absolute purity to all parts of the plant and has a capacity of 50 gallons per hour, but even after this precaution, as an additional one, the water is filtered. This is a very complete and efficient apparatus, being built of copper heavily returned and all connections and leads for the distilled water are of pure block tin which removes the source

Fig. 3

of many impurities that used at one time to be responsible for much of the fragility of the filaments.

Fig. 3 shows the factory laboratory, another large, bright room, finished exactly as the previous one. The tungsten is first put through a most ingenious crushing machine where it is ground to absolute fineness, and having been carefully strained, the various alloys and chemicals are added, and by various processes, are reduced by corrosion to the kolloidal state. The kolloidal solution is then squirted by heavy pressure through diamond dies of such fineness that the filament is hardly perceptible to the naked eye. The filament is then dried by the process of slowly raising the temperature until it finally reaches approximately 4,500 degrees Fahrenheit, by this means destroying all foreign substances and leaving the filaments absolutely pure tungsten metal. The filaments are then carefully measured by micrometer, thus ensuring absolute uniformity.

Fig. 4 is a portion of the technical laboratory, showing an electrical furnace for experimental work at very high

Fig. 4

temperatures and also a blast furnace of powerful type for operating at more moderate degrees of heat. In fact, special and intricate apparatus meets the eye at every glance, giving one an idea of the painstaking efforts of the company to spare no trouble or expense in providing a thoroughly up-to-date equipment.

The S. Morgan Smith Company, York, Pa., are installing a pair of turbines to develop 2,400 horsepower for the Maine & New Brunswick Electric Power Company, at their water power plant at Aroostook Falls. This installation was inadvertently credited in our January issue to another manufacturing firm.

Successful Annual Banquet

The Engineering Society of the University of Toronto held its 22nd annual banquet on Thursday, January 19, in Convocation Hall. Both in point of numbers and excellence of speaking the banquet was a very gratifying success. Among the chief speakers were Dr. Robertson, member of the Canadian Conservation Commission and Chairman of the Technical Commission of Ontario; Mr. Robert S. Gourlay, President of Toronto's Board of Trade; Captain Leonard, of Hamilton, representing the Board of Governors of the University of Toronto, and Hon. J. S. Duff, Minister of Agriculture for Ontario.

Dr. Robertson spoke on the vast and varied rsources of Canada and their value to the Canadian people if properly conserved and developed. The good work of the Conservation Commission was briefly mentioned. The doctor emphasized the necessity of technical training for the large army of workmen the universities do not reach, since it is upon these men, in large degree, that the possibility of an economical development of our national resources depends.

Mr. Gourlay spoke of Canada's manufactures, the big results from small beginnings, the value of these to Canada as a nation, the necessity for support until such ime as they may be placed on the same scientific basis as has been achieved by our neighbor to the south, and of the certain prospects for the future. Captain Leonard emphasized the value of military training not only in the remote possibility of active service, but as a source of excellent training and discipline. The Hon. Mr. Duff spoke of the closer relation between the class he represented and the universities. Farming is becoming each year more of a scientific pursuit. The time is soon coming when scientific agricultural training will be considered as necessary to the farmer as the engineering course now is to the engineer.

The Engineering Society is to be congratulated on this successful annual manifestation of its continued progress.

Calgary Street Railway System

To carry out 22 miles of extension during 1911, tenders have been received and awarded as follows, by the city of Calgary:

Cars and trucks—12 P. A. Y. E., The Preston Car & Coach Co., $30,879.

Motor equipment—24 Canadian General Electric Co. G. E. 80, $13,560; 20 Canadian Westinghouse Co. 101 B, $12,000.

Track material—J. W. Campbell, Agent U. S. Steel Co., Calgary, rails and fittings, $67,680.40; specials, intersections, $6,914. Corman, Clancy & Grindley, Agents Lorain Steel Co., Calgary, rails and fittings, $56,105; specials and intersections, $20,896. General Supplies, Ltd., Calgary, plates, bolts, and fittings, $2,951. Western Supply Co., Calgary, 50,000 ties, $27,000. Canadian Fairbanks Co., Calgary, rail fittings, $1,757. Peacock Bros., Montreal, for Hadfields, Sheffield, specials and intersections, $25,634. Total contracts made, $282,509.

All material is the best solid manganese specials, Lorain 60 ft., 60 and 80 lb. steel. American Wire Co. Bonds, Western Electric overhead material, and square fir ties are being adopted. The lowest tender in each case was accepted, except for cars, and all awards were made to Calgary agents, except the Preston Car Co., Dawson Co., and Peacock Bros. The Preston Car Co. were gven an advance in price on guaranteed delivery of the total order by August 1st, 1911. All other material is to be delivered for commencement of construction, May 1st, and it is expected that the work will be completed by November 1st, 1911, when Calgary will have 38 miles of track, and 30 miles of routes, with 30 cars.

Mr. Henry D. Bayne has been appointed special agent, in Montreal, of the Canadian General Electric Company and the Canada Foundry Company.

Mr. Charles B. Hunt, manager of the London Electric Company, has resigned.

Mr. A. J. Soper was married on December 26th to Miss Ethel Gertrude Chatham, of Montreal; Mr. and Mrs. Soper will reside in Toronto.

Mr. E. A. Graham, who has been engaged in installation of electrical apparatus for the city of London, left with the new year to take charge of the placing of the Westinghouse apparatus in one of the Winnipeg municipal substations.

Current News and Notes

Arnprior, Ont.
The by-law to authorize the pumping of water by electric power was carried. The power will be obtained from the Galetta Light and Power Company.

Battleford, Sask.
This town has now under consideration a hydro-electric scheme by which it is proposed to develop power at a point on the Battle River, some three miles from the town. The engineer's report states that from 1,200 to 2,000 h.p. is available.

Berlin, Ont.
Four municipalities voted on money by-laws in connection with the People's railway. In two cases the by-laws were carried and in two defeated. Fergus gave a majority of 177 for the by-laws providing for an investment of $20,000 and a majority of 219 in favor of granting the franchise. Luther township passed a by-law providing for the taking of $30,000 stock. In Proton and Garafraxa by-laws to the amount of $36,000 and $25,000 were defeated. Arthur and Elora will vote in February.

Brantford, Ont.
An application is being made at the present session of Parliament for an act to incorporate the Lake Erie and Northern Railway Company to build lines and operate railway, telephone and telegraph lines between Port Dover, Simcoe, Waterford, Brantford, Paris, Glenmorris, Ayr and Galt. The application also covers navigation rights, the idea being to make Port Dover a port of trade in coal, ore, lumber and grain, and to acquire or generate and sell electric current. The project will be carried out by the same interests which control the Grand Valley Railway Company.

Bracebridge, Ont.
A start in civic government by commission has been made here. The ratepayers carried a by-law to appoint a commission of two to manage the electric light plant, recently completed. Messrs. G. W. Ecclestone and Thos. Bird will be the commissioners.

Brockville, Ont.
The by-law to amalgamate the Light and Water Commissioners carried.

Bowmanville, Ont.
The plebiscite in favor of the electric light being managed by commissioners carried.

The by-law to grant a franchise to the Seymour Power & Electric Company, Limited, was carried.

Calgary, Alta.
Superintendent McCauley has recommended the construction of a number of flat freight cars and also a scenic car, suggesting that these might be built right in Calgary.

The street railway net profits for the year 1910 amounted to $66,700, or at the rate of 13 per cent. on the investment. This is also exclusive of 5 per cent. of gross profits which the city yearly sets aside for depreciation.

The Department of the Interior will be requested to grant the city an extension of time, until August 1, 1911, within which the Elbow river water power site, near Canyon creek, can be accepted or rejected.

A by-law is being prepared for the expenditure of about $300,000 for electric power, which will be spent in transformers and sub-stations and new machinery. In addition to this it will be necessary to provide more underground cabling.

All the street cars will in future be supplied with meters. Superintendent McCauley expects to economize in this way to a certain extent and believes it best for many reasons to know exactly what amount of current each car is using.

The new power committee has decided to spend $2,500 in building a road to their power site on the Elbow river. This will enable them to take weekly readings of the water flow which Engineer Kennedy is said to have judged off hand at about 400 cubic feet a second.

Thirteen applications, in all, have been filed with the Department of the Interior for power privileges on the Elbow and Bow rivers. Two of these apply to the Elbow, the other eleven to the Bow river. The dates of application are all the way from November 27, 1903, up to the present time.

The new steam power plant in Victoria Park is well under way and is expected to be in operation the second week in February. There is already installed 1,500 h.p. of Babcock & Wilson boilers, and one 900 h.p. 300 r.p.m. 3 cylinder compound Robb engine direct connected to a 600 k.w. Dick, Kerr Company street railway generator.

Chapman & Walker, Toronto, Ont., have been awarded for the Calgary Municipal system the contract for the supply of one 1,500 h.p. 2300 v., 3-phase, 60 cycle, 400 r.p.m. synchronous motor, to be direct connected to a 1,000 k.w. d.c. 550-600 volt generator; also one 200 k.w. motor generator exciter set; also complete switchboard apparatus—motor generator and exciter set, manufactured by Dick, Kerr & Co., Ltd.; switchboard by Cowans, Ltd., Manchester, England.

Camrose, Alta.
The new plant started up for the first run on January 7th and everything worked satisfactorily.

Edmonton, Alta.
This city will spend $130,000 in telephone improvements during 1911.

Four schemes are submitted in connection with the new 6,000 gallon pump, and the estimates of cost vary from $26,000 to $75,000 for the pumping plant alone.

Edmonton has appointed a city council committee to deal with the International Heating and Lighting representative with regard to a gas franchise. The International company asks for a twenty-five year franchise to supply gas.

The Edmonton Heat and Power Company, in which is included local and eastern capital, propose to produce several hundred thousand horse power by a hydro-electric plant on the Saskatchewan river, sixty miles up from Edmonton, where they have secured rights to construct a dam and other works necessary.

Ex-Mayor May, and M. W. Eager, barrister, Edmonton, are endeavoring to secure rights from the Dominion Government to build a dam on the upper Saskatchewan above Edmonton, for the purpose of developing hydro-electric power for the supply of Edmonton and towns in the vicinity.

One of the features of the Provincal Telephone Department for this year will be the strengthening of the long distance lines between Edmonton, Calgary and Lethbridge with new copper wire. There will also be a number of new exchanges and the remodelling of old exchanges. John Stocks, Deputy Minister.

Two important extensions of government telegraph lines into the north country are being planned for this year. One will carry the line northeast along the Athabasca river, to Fort McMurray, a distance of about 200 miles. The other will be down into Grande Praire from Peace River crossing to where the line was extended last year. Construction of these extensions will probably be commenced on the opening of spring.

The expenditure for power house department for financial year may vary from $139,750 to $298,750, according to the plans accepted by the commissioners. For the 2,000 kilowatt alternator alone, which will increase the capacity of the lighting and power plant, and also for the street railway department, the estimates vary from $80,000 to $190,000. Four alternative engines and alternators are estimated upon, giving this wide range of cost.

Edmundston, N.B.
The town of Edmundston, N.B., has applied to the legislature for authority to issue bonds to the amount of $40,000. The proceeds will be used next summer in establishing an electric light and power plant and in maintaining a dam at the second fall on Green River.

Fort Frances, Ont.
It is reported that arrangements are being made by Mr. Bachus to install new turbines for pulp grinding on the Canadian side.

Fort William, Ont.
It has been finally decided to abandon all efforts to heat the cars of the Port Arthur Electric Railway with electricity and install stoves. Recommendations have also been made to the two city councils that hot water systems be installed in the cars.

Guelph, Ont.
Guelph voted for the by-law to extend the radial railway into St. Patrick's Ward.

The Guelph Radial Railway, municipally operated, announces a net profit of $6,338 on the past year's operations. This is the best year in the road's history, the profits being more than 6 per cent. on the capital expenditure of $108,000.

The Ontario Gazette states that the Toronto Suburban Railway Company is applying for permission to extend its line from some point on its present authorized Guelph line to a point in or near Milton, and also to extend its line from Guelph to Berlin, Preston, Hespeler and Galt, and also to Hamilton. In order to

carry on this work it will be necessary to increase the present capital stock of the railway.

Hespeler, Ont.
The by-law to raise $4,000 for the extension of the electric light for street lighting was carried.

Hamilton, Ont.
Engineer Latham, of the T. H. & B. Ry. Co., has been in consultation with City Engineer Macallum regarding the electrification of part of their steam road.

The two new electrically operated pumps have been given a satisfactory trial run at the beach station. They have a combined capacity of 12,000,000 gallons and will give a 60-pound pressure over the city.

The Dominion Power & Transmission Company are installing a 6,400 k.w. Westinghouse generator with the necessary accessories of penstock, turbine, transformers, switching apparatus, etc., in their De Cew Falls power house near St. Catharines.

Steps are being taken to operate the east end sewage disposal works by Hydro power. The return power line from the beach pumping plant to the disposal plant has not yet been built, and that work will have to be undertaken very soon. City Engineer Macallum.

The town of Dundas sought to restrain the Hamilton Cataract Company from crossing the Desjardins Canal to supply power within the Dundas town limits. Justice Middleton gave judgment in favor of the Hamilton company, finding that the wires would not interfere with navigation.

Hon. Adam Beck states that power can be supplied in Hamilton to residences at 3½ cents per k.w. hour.

George Lynch Staunton, K.C., acting for a number of Hamilton capitalists, has obtained a provincial charter for an electric railway between Hamilton and Port Dover on Lake Erie. The line, it is estimated, will cost $1,000,000, and will take in as many as possible of the towns to the south of this city.

Kelso, Ont.
The government telephone line has been completed between here and North Bay and was opened for business on January 1st.

Kingston, Ont.
The by-laws for electric light improvements and for the extension of Barrie St. were carried.

Water powers, adjacent to Calabogie, Renfrew County, and High Falls, Labelle County, are said to have been secured by Iroquois capitalists, and if there is sufficient market will be utilized to generate and transmit power through Eastern Ontario. Mr. M. Beach, who was here representing the capitalists, stated that they can provide Kingston with electrical energy for $20 per horsepower.

Listowel, Ont.
The by-law to raise $5,000 to complete the electric light system was carried.

London, Ont.
The directors of the London Electric Light Company have been authorized to meet the prices of the city at every point.

Mr. E. I. Sifton, electrician, has been engaged by the city to solicit contracts and explain matters to prospective users of Niagara power.

Moncton, N.B.
Work on a street railway for this city will be begun in the early spring. A franchise has been granted to the Moncton Tramways Electrical and Gas Co., Mr. Boggs, manager.

Moose Jaw, Sask.
Mr. John R. Green, through his solicitors, has issued a writ against the city, claiming that the street railway by-law and agreement is illegal and asking an injunction restraining the Moose Jaw Electric Railway Co. from continuing construction work.

Mitchell, Ont.
The by-law establishing a water and electric light commission carried.

Montreal, Que.
The Montreal Street Railway Company donated the sum of $3,500 as a Christmas gift towards the funds of the Montreal Street Railway Mutual Benefit Association.

Alleging that its competitor, the Dominion Light, Heat & Power Company, had not observed the terms of an injunction against placing its poles within three feet of its own, the Montreal Light, Heat & Power Company has taken contempt of court proceedings against them.

The Westmount City Council decided to reduce the rate for street lights from $73 to $65 a year. But while the price per light was cut down, it was stated that this would not mean a reduction in expenditure, but an improvement in the lighting, as the drop in the bills would enable the city authorities to add 25 lights to the streets.

The Directors of the Saraguay Electric & Water Company have authorized Mr. Charles Brandeis, civil and electrical engineer, 4 Phillips place, Montreal, to proceed with the plans for their new power house, machinery, etc., at an estimated cost of $225,000. Contracts will be placed on or about the 1st of February next. Steam turbines will be installed in units of 3,000 h.p. each. Plans and specifications can be seen at Mr. Brandeis' office at an early date.

Nelson, B.C.
Owing to the step grades on the Nelson Street Railway system, Provincial Inspector Rae has ordered the installation of air brakes and air blast sanders on the coaches before they are again operated. The purchase of a third coach is also advised in order that a continuous service may be maintained.

Newcastle, Ont.
The Seymour power by-law carried by a large majority.

Niagara Falls, Ont.
Stamford Township ratepayers voted down the by-law to grant the Niagara Falls, Welland and Dunnville Railway right of way through the township.

Orilia, Ont.
Owing to a bad break in the flume, the power house at Ragged Rapids was badly flooded on January 19th. It will probably be some days before the plant will be in operation again. This is a unit which was installed by the town without the assistance of an engineer.

Ottawa, Ont.
The Long Sault Dam project is being introduced at Washington. A bill has been introduced "to provide for the construction of dams, locks, canals and other appurtenances in the St. Lawrence River at and near Long Sault Island, St. Lawrence County, New York.

The contract for the additional poles required for extending the "white way" to Rideau and Bank streets was awarded to the Canada Foundry.

Sir Henry Bate, chairman of the Ottawa improvement commission, is arranging a conference with the electric, telegraph and telephone companies in order to come to some understanding whereby all the poles on the streets will be painted one color, as near the color of tree bark as possible.

Mr. J. A. Ellis, secretary of the municipal electric commission, is of the opinion that in little more than two months' time Bank street from Wellington to Gladstone avenue, and Rideau street from the Sappers' bridge to Nicholas street, will be lighted similarly to Sparks street.

The question of power supply from the Rideau canal by the construction of dams is being considered by the Public Works Department. The Minister has despatched engineers over the route of the Rideau waterways to ascertain what powers are available and whether they can be economcially developed.

The Nepigon Albany Canal & Transportation Company is applying for power to construct a continuous waterway from Nepigon Bay on Lake Superior to James Bay, via the Nepigon River, Lake Nepigon and the Albany River, with incidental power and transportation rights.

Notice has been given of an application to Parliament for an act to incorporate the Western Canal Company, with power to construct a canal from the Rainy River below Fort Frances to a point on the river five miles below the Long Sault Rapids, and to develop electrical power thereby.

In order to encourage the copper industry, an order-in-council has been passed stating that "No royalty shall be charged on products of copper mining locations for a period of ten years, that is, up to January 1, 1921, and that no reservation be made in patents issued for such locations of a royalty on the sale of products thereof during that period."

Mayor Hopewell suggests that Ottawa should buy a power site in the vicinity, in self defence, and even if there is no immediate need of power development. Chats, Gatineau and Lievre Falls are favored in the order named. The municipality has an agreement with the Ottawa and Hull Electric Company for supply of power at $15.00 per h.p., which does not expire for about 7 years.

The Morrisburg and Ottawa Electric Railway asked permission from Council to run electric cars over Main street and Hawthorne avenue, in Ottawa East; for an entrance into the city to the freight and passenger terminal station, which it is proposed to erect on the west side of Main street at the corner of Hawthorne avenue. The city was also asked to grade Main street before the tracks were laid.

A recent Canada Gazette contains an order-in-council stating that "a mill has been established in Canada adapted and equipped for rerolling in substantial quantities rails used in railway tracks weighing less than fifty-six pounds per lineal yard when rerolled. Hereafter rails rerolled in the United States can

only enter Canada upon paying a duty of $7 per ton.

American and English capital is said to be interested in the establishment of an electric smelting plant at Chats Falls on the Ottawa River, about 20 miles west of Ottawa and active work preparatory to the erection of the plant may begin early in the spring. The surrounding country in the Quebec side is rich in iron ore, the only difficulty being that of transportation, to overcome which it is proposed to build an electric line from the Falls to the mines.

The operation of the municipal electric light and power plant during the past year has been so successful from the financial standpoint that the Commission will probably recommend to the Council a reduction of from ten to fifteen per cent, in the prices now charged consumers for light. The Ottawa Electric Company has also had a good year, as has been shown by the distribution among the shareholders of a two per cent. bonus above the regular 6 per cent. divident.

Outremont, Que.

A resolution was recently passed unanimously to have all wires, lighting, power, telegraph and telephone, placed in underground conduit. Professor Herdt will be asked to estimate the cost and prepare plans. The matter will be discussed before the Public Utilities Commission.

Peterborough, Ont.

The operating and commercial departments of the Bell Telephone Company in Peterboro will in future be operated separately. Mr. A. A. Smith will have charge of the operating department, and Mr. F. W. Doan of the commercial department.

Port Hope, Ont.

A by-law granting a 30-year franchise to the Seymour Electric Power Company was carried here.

Penticton, B.C.

The by-law to raise $71,000 for the installation of electric light service was carried.

Port Arthur, Ont.

We are informed that the ratepayers authorized the expenditure of $15,000 for improvement to street lighting. N. G. Neill, industrial commissioner.

The offices of the Port Arthur and Fort William Street Railway system have been moved to the new car barns, where Manager Robinson in future will have his office.

Portage la Prairie, Man.

At a meeting of the city council a special committee was appointed to ascertain the possibility of purchasing a central electric light and gas plant with the view of a municipal owned plant to furnish the city with light and power.

Qu'Appelle, Ont.

A scarcity of fuel caused the temporary shutting down of the light plant.

Regina, Sask.

The council has instructed the commissioners to meet the Government officials in regard to the steps necessary to the establishment of a municipally owned gas plant.

The Street Car Committee will call for tenders for supply of cars. Commissioner MacPherson submitted blue prints for two classes of cars, pay-as-you-enter, and the ordinary car.

The City Council decided to place an order with the Ottawa Car Company for four single and two double-truck cars for the new municipal street railway, under construction. Delivery July 5th, 1911.

Tenders marked "Tenders for Street Railway Materials D," addressed to the City Commissioners, will be received until January 31st for supply of trolley poles and railway ties. Particulars upon application to City Engineer, L. A. Thornton.

Tenders addressed to S. P. Porter, Deputy Minister, will be received until February 9th for supply of insulators, toppins, guy wire, copper sleeves, crossarms, galvanized iron wire, pole line, hardware, etc. Specifications at Department of Railways and Telephones.

The United States Steel Products Company have practically been selected to supply all rails, spikes and bolts necessary at a total cost of $47,409.90. Of that amount $46,846.90 is for rails. The tenders for the rails required very little attention as the American firm was pracitcally alone in the field in that respect.

The new city treasurer has discovered that the users of electric light in this city are in arrears to the extent of about 10 per cent. of a total year's earnings. Some of these arrears date back more than 12 months and range in size from a few dollars to over $100. No attempt beyond sending the periodical notices appears to have been made to collect these accounts.

The Street Railway Commissioners recommended the award of supply as follows: For the overhead work and other equipment: Northern Electric Company—Straight line hangers, $42 each; line ears, $26.90 each; double curve hangers, $56.20, and single curve hangers, $35.20 each; strain plates, $33 each; strain ears, $37 each; left hand trolley frogs, $270 each; right hand trolley frogs, $270 each; crossovers, $410 each.

General Electric Company — Turnbuckles, $65 each, and lightning arresters, $400 each.

The plans of the city commissioners call for the laying of five and one-half miles of street railway track during the present year, at a cost of about $135,000, and the laying of six miles of track during the year 1912 at a cost of about $125,000.

The rails necessary for the completion of the work outlined by the city commissioners have been ordered and a considerable portion delivered already.

The total estimated cost of the work during the present year is $213,000, and for 1911 and 1912, $402,000. The estimates of the commissioners for the present year provide as follows:

Five and one-half miles track..	$135,000
Six cars	38,500
Snow sweeper	4,500
Power unit	20,000
Car barns	15,000
	$213,000

For 1912 provision is made for the addition of seven cars.

The contract for supply of rails, etc., for municipal railway here went to U. S. Steel Products Co., of which the details are as follows: 560 gross tons 80 lb. Lorain sec. 335 rails at $58.84; 247 gross tons A. S. C. E. 60 lb. rails at $50.50 620 pair Lorain splice bias at $3.10 per cwt.; 460 pair A. S. C. E. splice bias at $2.45 per cwt.; 5560 Lex. head bolts at $4.50 per cwt.; 6,000 rail spikes at $2.60 per cwt.; 2200 rail bonds M.P.3 4/0 13 inch c-c at $46.25 per cwt.; 100 cross bonds C. P. X. 4/0 60 inch c-c at $91.00 per cwt.; 20 cross bonds C. P. X. 4/0 66 inch at $98.00 per cwt. L. A. Thornton, city engineer.

Renfrew, Ont.

A report was received from the engineers re the building of reservation dams on the upper lakes of the Bonnechere to the effect that a 10-ft. dam on the outlet of Lake Clear could raise the water seven feet, thus giving additional power for 100 days during the low water period of the Bonnechere.

Seaforth, Ont.

One man each is to be appointed by the Seaforth Electric Light Company and the Town Council to make an inventory of the lines and poles of the company. This inventory will be submitted to the Hydro-Electric Commission for valuation. The town agrees to pay the commission the full value of the poles and wires as fixed by the commission and 75 per cent. of the cost of construction.

Strathcona, Alta.

At a meeting of council the recommendation of the fire and light committee, based on the information of Electrical Engineer Ewing as to the inefficiency of the power plant (noted in issue of December 28th) that equipment to the value of about $72,000 be purchased at once, was adopted. The details of this expenditure was given as follows: 600 k.w. generator, $14,300; accompanying engine, about $20,000; necessary boilers, $32,000; provision to be made later for the installation of an exhaust steam turbine engine which would increase the capacity 400 k.w. Chairman Richards stated no time would be lost in securing tenders for machinery supply.

Stratford, Ont.

The statement submitted by the Light and Heat Commission for the six months ending December 31st, shows a profit on the electric light plant of over $3,500.

The Sherbrooke Council has accepted the tender of Messrs. Morrow and Beattie, Peterborough, Ont., for the building of the new dam and power house. The figure was $51,220. Messrs. Ross and Holgate, engineers, of Montreal, were appointed to supervise the entire work. The total cost will be about $100,000.

St. John, N.B.

It is said the Grand Falls Power Company are already preparing to begin active development operations.

The Maine & New Brunswick Electrical Power Company is making arrangements to build a power line from its plant at Aroonstook Falls to Limestone, Van Buren and St. Leonards, running near Grand Falls. The object is to sell electrical power for lights and motors in the towns reached, also to furnish electrical power for the construction work during the establishment of a power plant on the St. John river at Grand Falls, which, it is understood, will soon be built by a company which has recently gained control of it.

St. Thomas, Ont.

Electrolysis is believed to have eaten into the metal pipes of the heating system which supplies the public library

and city hall. The library cannot be used in the meantime.

Strathroy, Ont.

The by-law to raise $6,000 for improvements to the electric light and waterworks systems carried.

Thorold, Ont.

Local improvement and two power by-laws were carried.

Toronto, Ont.

The issue of city of Toronto street railway debentures to the amount of $645,743 has been authorized.

The City Engineer was instructed by Board of Control to purchase steel rails for the new civic railway system and authorized to have the grading work done by day labor.

The Dominion Cabinet has approved the plans of the Hydro-Electric Commission for its transmission lines along the waterfront, subject to certain modifications asked for by the engineers of the Public Works Department.

The business office staff of the Bell Telephone Company, Toronto, have moved into their new building, 76 Adelaide street west. The new building is a 5-storey red stone structure, covering an area of 100 by 150 feet. This makes the seventh Bell exchange in Toronto. The total number of employes is now about 1,100.

The recommendation of the City Engineer that the Toronto Railway Company be ordered to lay a double line of car tracks on Danforth avenue from Broadview to a point 200 feet east of Greenwoods avenue and to extend the service thereon, was endorsed, along with the recommendation that the track allowance be paved with brick block, placed on a concrete foundation, at an estimated cost of $66,000. It was further recommended that the company be ordered to lay tracks on Greenwoods Avenue from Gerrard Street on Danforth Avenue, and to extend the service thereon and that the track allowance be similarly paved at an estimated cost of $54,050.

Vancouver, B.C.

Tenders are called until February 8th for supplies for electrical department for 1911. W. McQueen, city clerk.

The Vancouver Power Company have commenced work on a three phase power line from the sub-station to Shannon Mountain to connect with the rock crusher at the city quarries. The poles are being erected and the work of stringing the wires will commence early in the new year.

The British Columbia Hydraulic Power Co., Ltd., Vancouver, is making application under the Water Act for a water record of 500 cubic feet per second, to be taken from Nanaimo river and lakes at a dam 30 feet high, about 1,200 feet above Nanaimo falls, and raising the water level to a point 3,500 feet above the point of diversion.

The gross receipts of the British Columbia Electric Railway for the year ending June 30, 1910, increased by 31 per cent., while the net earnings disclose an advance of 19 per cent. There is available for distribution after everything has been met, a sum of £67,452. The holders of deferred ordinary stock will receive 8 per cent.

Victoria, B.C.

Tender will be called soon for 2,000 pounds of copper wire for city light department. W. M. Northcott, purchasing agent.

The electric lighting by-law ($25,000) was carried; also the underground telephone by-law.

Angus Smith, city engineer, is authority for the statement that plans and specifications were being drawn preparatory to the calling for tenders for the large amount of street work contemplat- It is hoped that contracts for much of the work will be let within two weeks' time.

The rate to be charged the city for power by the British Columbia Electric Railway Company when the Jordan River supply reaches the city is the exceedingly low rate of 1.075 cents per kilowatt hour. The electric light committee recommended that the tender of Hawkins & Hayward for the supply of the following be accepted: 250 lamps at $127 per hundred; one gross of 14-in. globes at $270; two gross of 12-in. globes at $162.

Waterloo, Ont.

The by-law to raise $40,000 for electric light purposes was carried.

Weston, Ont.

The contract for construction of transformer station and fire house has been awarded to George B. Moog, Berlin, $6,900.

Winnipeg, Man.

A contract for the supply of 47,000 telephone poles has been awarded to J. H. Hyland & Company, timber merchants, Winnipeg, by the Manitoba Government Telephone Commission.

Winnipeg, Man.

The local branch of the General Electric Company was recently destroyed by fire. Loss, about $7,000.

It is said the Winnipeg Street Railway Company will install a new steam turbine plant within the city limits at a cost of half a million dollars.

It is reported that the Winnipeg Railway Company will erect a new auxiliary steam plant within the city limts at a cost of half a million dollars.

Tenders are being called until February 14th by the Provincial Government Telephone Department for construction material and supplies. Particulars on application to F. C. Paterson, chairman.

M. Peterson, Secretary Board of Control, writes that The Gregory Electric Company, of Chicago, supplied the 65 k.w. generator for operation of temporary electric drive at Point du Bois. Price, $525, f.o.b. Chicago.

Condensed Department

RATES.

Positions Vacant / Positions Vacant / Miscellaneous. — 2 cents a word and 25 cents for a heading, per insertion.

Tender advertisements, equipment for sale, etc, 15 cents per agate line (14 agate lines make one inch) per insertion.

Advertisers who wish to conceal their identity may do so by using an Electrical News box number without extra charge.

Forms close on the 18th of each month.

For Sale

Two 2,000 k.w. 2,400 volt, 66 2-3 cycle, 3-phase S.K.C. Generators, 286 R.P.M. These machines have lately been rebuilt in the United States and are good as new. Low price for cash.

For particulars and price apply

J. F. H. WYSE,

2-2 610 Continental Life Bldg., Toronto.

City of Strathcona
(Alberta)

Tenders for

Engine, Boilers and Generators

Tenders addressed to David Ewing, Chief Engineer, power house, Strathcona,, Alberta, for above machinery, will be received until noon, **Wednesday, March 1st, 1911.** Specifications may be obtained upon application to the undersigned.

A. J. McLEAN, City Engineer.

Strathcona, Alta., Jan. 16, 1911. 2-p

Positions Vacant

For a man with fair technical education for literary work. Applicant must be able to speak and write both German and English correctly, must have some experience in writing engineering articles, and will be expected to operate a typewriter.

Applications in own hand writing, both in German and English, giving references and stating salary expected, should be sent to the Chief Engineer of the Hydro-Electric Power Commission of Ontario, Toronto, Canada. 2-2

Miscellaneous

REPRESENTATIVES WANTED — Reliable firm manufacturing complete line of electrical measuring instruments, want responsible representatives to handle their lines throughout the whole of Canada. Are prepared to deal separately for Eastern and Western Canada. Box 195, Electrical News, Toronto Ont. 2-2

British firm of electrical and mechanical engineers manufacturing electric lighting specialties, wants to secure reliable Canadian rerresentatives who will carry a stock in Canada. Write for particulars to Box 197, Electrical News, Toronto, Ont.

AGENTS WANTED in all parts of Canada to handle wood preserving for Poles, Cross-Arms, Railroad Ties and Construction Timber. For particulars write W. D. Ward, Tribune Building, New York. 2-4

For Sale

Eight arc lamps, good condition, alternating current, 104 volts, Weston Electric type. Address L. R. Cossitt, Brockville, Ont. 2-2

Electrical News

Generation, Transmission and Application of Electricity

PUBLISHED MONTHLY BY

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ADVERTISEMENTS.

Orders for advertising should reach the office of publication not later than the 20th day of the month preceding date of issue. Changes in advertisements will be made whenever desired, without cost to the advertiser.

SUBSCRIPTIONS.

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Subscribers are requested to promptly notify the publishers of failure or delay in delivery of paper.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 20 Toronto, March, 1911 No. 3

High Voltage Transmission Research

There is no question occupying the thoughts of Canadian electrical men to-day of equal importance with long-distance transmission. Canada's water powers are ample but not evenly distributed. A range of 200 miles at best is all that can be economically served to-day, and until power can be carried, without great loss, much greater distances industrial progress will be hampered for lack of the energy which lies in plenty just beyond our reach.

In electrical laboratories everywhere men are spending precious years investigating the causes which produce the heavy line loss at high voltages—heat losses, corona losses, etc., and are vainly trying by theory to overcome difficulties which they only know under abnormal conditions. A recent paper by Professor Ryan before the A. I. E. E., for example, admits that certain of his laboratory results obtained some years ago are not within 30 per cent. of actual working results as since obtained. The conditions under which a line operates cannot possibly be duplicated in the laboratory, and results at best are only indicative and never conclusive.

Now the Ontario government has just completed a 110,000 volt transmission line which, being the highest in the world, was either the result of uncertain laboratory calculations or the lucky inspiration of a gifted engineer—since the line is giving every evidence of being a success it really does not matter which—but, the line being here, in actual operation, conditions are created which make further laboratory experiment useless and unnecessary.

The Ontario government is now in a position to give to the whole scientific world the advantage of its own pioneer experience. Every electrical engineer has been anxious that the line should be a success because he has felt that another distinct advance will have been made in the science of electrical transmission. He is equally anxious now to know the actual conditions under which the line is operating, and the government should lose no time in recording and publishing actual measurements of live loss under every conceivable condition to which their transmission wires are exposed.

Further than this, conditions are ideal in a university city like Toronto for research work of the most important order. It is conceivable that aluminum is not the best possible conductor, that the size used is not the best, that there may be certain insulators not yet tried that would give greater efficiencies, that pressures a little higher or a little lower may carry with less loss or that any other of a large number of conditions may not yet have been perfected. Why not place a trained university research scholar on the work? Give him a shunt line to experiment on; give him transformers, meters and conductors; let him work in the open air under actual conditions; keep him at it till he gets results.

It is impossible to predict the value to scientific engineering of such a practical research.

Might is Right

Some months ago the Montreal Light, Heat and Power Company of Montreal applied for and secured a permanent injunction against the Dominion Light, Heat and Power Company, preventing the latter from placing their poles, wires and other electrical apparatus at a distance of less than three feet from the poles, wires, etc., of the former. Notwithstanding this order the Dominion L. H. & P. Co. has erected a series of poles on Orleans avenue "which poles are not only placed at a distance of less than three feet, but which have been actually placed in the middle of the Montreal L. H. & P. Co.'s wires (see Toronto streets), and in such close proximity to these wires that it has been found necessary to fasten them with insulators (see Toronto streets again) to prevent the wires from touching the poles of the latter company."

This matter having been again brought to the attention of the Supreme Court, judgment has been handed down by Mr. Justice Charbonneau requiring the Dominion Company to pay a fine and remove its poles forthwith, giving the rival company power, if this order is not obeyed, to remove the objectionable poles and apparatus, at the owner's expense. The reason given by the court for this order reads, in part, that this mode of installation "constitutes a very considerable inconvenience to the rival company and a permanent source of danger to its apparatus and also to the public.

It is noticeable, however, that in Ontario, there are towns where placing a rival company at "considerable inconvenience" is not a factor which regulates the course to be pursued, or if it is, it is a factor which causes pleasure rather than concern, and where the question of "danger to the public" is subordinated to reducing cost or to haste in construction. British ideas of fair play have permeated our sister province to the extent at least that they do not deliberately inconvenience a rival there, but in Ontario instances can be multiplied where the very reverse seems true.

The forest of poles that has been thrust by one system through the wires of another in Toronto can be characterized as nothing less than a forced inconvenience to the company that was first on the ground, and the danger to the public cannot well be less in Toronto than under the same conditions in Montreal.

There is a difference, however. In Montreal the contest was between two private companies, so that each was dealt

justly by. But in Toronto it is a private company and a municipality. And the municipality has the power. And in the minds of this municipality "might is right."

Electric Shock Not Immediately Fatal

A legal case of considerable interest dealing with the death, by electric shock, of a young Winnipeg man, was recently heard in that city. The accident was said to have been brought about by the use of a long-based high-low lamp wherein over half an inch of live metal was exposed to contact with outside objects. The drop was hanging almost directly over the bath in which the young man was standing.

The point of particular interest was that it was shown that the shock did not prove immediately fatal as the young man was heard to groan some time after the accident, although, strangely enough, no effort was made to restore him. The suggestion was made by the Crown that this might not be an isolated case and that it was quite possible many fatal cases of electric shock might be prevented if prompt measures for resuscitation were taken. He further suggested that the value of such measures did not appear to be widely known and ought to be given due publicity.

City electrician Cambridge expressed himself as having no doubt the young man might have been restored if proper measures had been taken, and alluded to the fact that a branch of the St. John's Ambulance Association was just in process of formation in the city and that it might be well to take the matter up with this association. It is understood steps are being taken to bring this about.

World's Copper Production

Among the various copper statistics set forth in the 1911 issue of "Metal Statistics," a table is given showing the total production of this metal for more than one hundred years, or from 1800 to 1910 inclusive, which demonstrates in a very graphic way, the tremendous strides that have been made in this industry within the last ten years. According to this authority, we learn that the production of copper in the United States, and the world's total production by decades, has been as follows, in tons of 2,240 lbs.:

	United States Production.	World's Production.
1801-1810	....	91,000
1811-1820	....	96,000
1821-1830	....	135,000
1831-1840	....	218,400
1841-1850	2,400	291,000
1851-1860	37,050	505,999
1861-1870	97,100	900,000
1871-1880	188,000	1,189,400
1881-1890	732,507	2,221,236
1891-1900	1,941,390	3,710,651
1901-1910	3,822,469	6,856,944
Total	6,820,916	16,215,630

Pulp Company Installs S. Morgan Smith Turbines

Plans have been prepared for the new ground-wood mill of the East Canada Power and Pulp Company, Limited, to be located at Nairn Falls, five miles from Murray Bay, on the line of the Quebec and Saguenay Railway. The hydraulic development will produce approximately 10,000 h.p. The dam to be erected is of the Ransom hollow type and the head will be 65 feet. The penstocks are being made by Walsh's Holyoke Boiler Works, the same firm which installed the penstocks for the plant at Grand Falls. The wheels will be furnished by the S. Morgan Smith Company. These will comprise three units of grinder turbines, each consisting of a pair of double discharge quarter-turn turbines, capable of developing 2400 h.p. each, under 60-ft. head; also two single horizontal turbines for driving wet machines and other machinery, each of a capacity of approximately 1,000 h.p. Twelve grinders built by the Holyoke Machine Company will be installed in three lines, each line to have 2400 h.p. The grinders will take wood 30 in. in length, and will have a capacity of eight to nine tons a day, dry weight. The railway from tide-water to the mill will be completed by July 15th, 1911, and it is expected the mill will be ready for operation by October 1st. The Bishop Construction Company, of Montreal, have the general contract, and also the contract for the branch railroad.

The East Canada Power & Pulp Company have taken over the limits of the Murray Bay Lumber & Pulp Company and the Labrador Power Company, which holds the franchises for furnishing light and power to the villages of Murray Bay, Point a Pic, Cap a l'Aigle and St. Irene.

The engineer in charge is Mr. Geo. F. Hardy, of New York City, and we understand it is the intention of the company to erect a plant which will incorporate the most advanced Swedish and Canadian practices in the manufacture of ground wood. The officers of the company are; President, Rodolph Forget, Montreal; vice-president, Chas. W. Tooke, Syracuse; secretary and treasurer, L. C. Haskell, Montreal.

New Locomotive for Q. R. L. H. & P. Co.

The Quebec Railway, Light, Heat & Power Company have just placed a new electric locomotive in commission on their Montmorency division. This locomotive, shown in the accompanying sketch, was manufactured in the shops of the company, at Ste. Anne de Beaupre, and is intended as the forerunner of a number of other similar units which will eventually do away entirely with steam operation on the Montmorency division.

The dimensions of the locomotive are as follows: length

Electric Locomotive on Quebec Railway

over all, 34 ft.; width, 8 ft. 8 in.; weight, 59,300 lbs.; gauge of track, 4 ft. 8½ in.; diameter of driving wheels, 33 in.; wheel base of each truck, 6 ft. 6 in.; total wheel base, 28 ft. 8 in.; axles, 4½ in.; journals, 7 x 3½.

Axle carries a motor wound for 600 volts. Flanges, journals and boxes are M.C.B. standard. Longitudinal frame consists of two outside pitch pine sills 12 x 5, and four inside 9 x 4½. Steps are provided at each end on the sides. The body bolster is of wrought iron. The cab is of wood, size 11 ft. x 8 ft. 6 in., with two windows 30 x 28 on each side, and one each end of the same size; two glass doors at the end. Hoods at each end of the cab cover the resistance and other electrical equipment. The locomotive

is fitted with a hand brake on all the wheels, also with the Westinghouse automatic air brake. Equipment includes a bell and whistle.

The gear ratio is 14:68, gives a normal speed of 18 miles per hour, and on a level carries 400 tons at a speed of 10 miles per hour. The locomotive carries a quadruple equipment of four No. 56 Westinghouse railway motors, having a nominal rating of 55 h.p. each, total of 220 h.p. at 600 volts. Standard nose suspension is used. The one K34 controller is located in the centre of the cab.

Tungsten and Titanium Production

Although the figures from all the countries producing large quantities of tungsten are not yet available, enough are at hand to show that the world's production for 1909 was larger than in 1908, and was possibly equal to that of 1907. The estimated output for 1909 was 5,289 short tons of concentrates containing 60 per cent. of tungsten trioxide, compared with 3,898 tons in 1908 and 6,062 tons in 1907. In very few of the returns, however, is the percentage indicated, and this is necessary in comparing figures. It is probable that most of the exported ore is richer than 60 per cent. in tungsten trioxide, and that the figures are therefore low. The principal sources of the 1909 production were: United States, 1,619 tons; Argentina, 900 tons; Australia, 1,200 tons; Bolivia, 168 tons; Germany, 106 tons; Portugal, 609 tons; and the United Kingdom, 421 tons. The value of the tungsten ore produced in the United States during 1909 was $614,-370, compared with $229,955 in 1908 and $890,048 in 1907. With the recovery of the American steel trade during 1909 prices rose above those of 1908 and ranged from $5 to $9 per unit for tungsten ores, the average price being $6 to $6.50 per unit.

So far as known, the rutile (titanium oxide) deposits at Roseland, Va., are the largest in the world. The use of titanium in making steel rails increased considerably during 1909, and an American railroad which has given rails treated with ferrotitanium a long trial reports that they are proving satisfactory. The use of titanium in arc-light electrodes is also growing. Of these, there are two principal types, one of which is an electrode made of finely ground titanium carbide, the other is composed of magnetite, chromium oxide, and rutile.

A Big Nova Scotia Scheme

A scheme involving the expenditure of more than a million dollars is on foot at Liverpool, Nova Scotia, whereby extensive water powers in that vicinity may be harnessed for the purpose of supplying electricity. Surveying operations under the supervision of Mr. Holgate, of Ross & Holgate, Montreal, are being carried on and it is believed that sufficient power can be developed to supply the city of Halifax with all its electricity.

Speaking of the undertaking, Judge Forbes, of Liverpool, said the people of Nova Scotia, and more especially of Liverpool, are highly enthusiastic over it. In Liverpool there is running from Lake Rosignol and adjoining lakes, eighty to one hundred square miles of water, lake service, and 300,000 square miles of hillside drainage. At the lowest it is estimated that this would generate a continuous 25,000 horse power which could be transmitted to Halifax, a distance of eighty miles. No power east of Halifax could be utilized so cheaply. At present this supply is harnessed to a small extent, 5,000 horse power being used by pulp and paper mills. In connection with the enlarged scheme it is also intended, provided it should be carried into effect, to erect four pulp, box and paper mills in the vicinity of Liverpool. John L. McLeod and George S. McClaren, large pulp mill owners in Liverpool, are backing the scheme. C. E. Yorston, assisted by Hugh Morrison, are at present carrying on a survey of the water powers.

The promoters will apply for the necessary legislation to carry through the scheme at the coming session of the Nova Scotia legislature.

Railless Electric Cars

It is reported that the British Parliament during its coming session will be called upon to consider 16 bills to confer power for the installation of railless electric car systems. Five of these bills are promoted by the British Electric Railless Traction Company (Ltd.), and the first electric cars of this type to operate in Great Britain will be delivered by this company to two Yorkshire towns in the near future.

It is claimed that the railless system is as cheap to operate as the ordinary track street car, while the capital expenditure involved in street work is only one-fourth to one-third of the $70,000 to $75,000 per mile required for the usual street car system.

It is further claimed that the system has advantages over petrol motive power, that the cars are lighter than the ordinary motor bus, run with very little vibration or noise, and that the rubber tires prevent any great wear upon road surfaces.

Municipal Ottawa Reduces Rates

The annual financial statement of the municipal lighting and power operations for the year 1910 shows gross revenue $134,646, as compared with $116,000 in 1909. Net surplus in 1910 was $23,789.

It has been decided to reduce the rates for both house lighting and power. The reduction in house lighting rates figures out at about 19 per cent. The new lighting schedule follows: 4c. per 100 square feet of area lighted, and 3½c. per kilowatt hour for current consumed, less 10 per cent. discount for payment within fifteen days. No meter rental to be charged. The old rate was 8 cents per kilowatt hour but the new plan figures out, according to the business of last year, to 3 cents per kilowatt hour, making with the 3½ cents per kilowatt hour for current used 6½ cents as compared with the old rate of 8 cents. For power used in houses for domestic purposes other than lighting, the charge will be 3½ cents per kilowatt hour instead of 8 cents which was formerly charged.

Power Rates.

Flat rate per horse-power per year, based on installed horse-power or maximum demand, 1 to 4 h.p., $29 per h.p.; 5 to 19 h.p., $28 per h.p.; 20 to 49 h.p., $27 per h.p.; 50 h.p. and over, $26 per h.p.

The differential rates are graded as above being:

Fixed charge per installed horse-power, per year or maximum demand, $15 for 1 to 4 horse-power, grading to $12 per horse-power for 50 h.p. or more.

Meter rate per kilowatt hour for consumption, 2 cents for 1 to 4 h.p., grading to 1¼c. for 50 or over.

Restricted class hours, restricted from 4 to 12 o'clock p.m. during the months of October to March inclusive, $20 per h.p., for from 1 to 4 h.p., grading to $17 per h.p. for 50 h.p. or more.

Summer rate, April to September inclusive, $15 per horse-power for from 1 to 4 h.p., and grading to $12 for 50 h.p. or more.

All these rates are subject to a ten per cent. reduction for prompt payment.

Stratford Rate Equal to Seven Cents

Stratford has finally decided to adopt the plan of lighting charges originally decided upon by the committee of engineers appointed to adjust this matter. The rates now stand as follows:

For residential lighting—4c per month per 100 square feet, outside dimensions, less 10 per cent. reduction for walls and partitions. To this is added 4½c. per kilowatt hour, but no meter charge, less 10 per cent. discount for prompt payment. In addition, free carbon lamp renewals of 8 or 16 candle-power are allowed. It is estimated that this rate will be equivalent to about 7c. net per kw.h. under normal conditions. Residences have hitherto been paying 12c. per k.w.h., and 25c. per month meter rate.

Commercial lighting (covering stores, theatres, hotels and factories)—12c. per k.w.h. for the first hour's daily use of installed capacity and 4½c. per k.w.h. thereafter, with free lamp renewals and no meter charge. A discount of 10 per cent. for prompt payment.

Churches—Same as commercial rates, but 20 per cent. discount for prompt payment.

Sign, window and display lighting—$6 per month per k.w.h. connected, subject to 10 per cent. discount for prompt payment. Free lamp renewals the same as house service.

Verandah or porch lamps (not on meter)—15c. per month for 16 candle-power, less 10 per cent. discount, and free carbon lamp renewals.

A minimum bill of 50c. per month will be charged every customer, less usual 10 per cent. discount.

Cheaper Light in Fort Frances

The town of Fort Frances has adopted the following schedule of lighting rates:

A rate of $2.00 per 16 candle power light to users of 5 lights and less, with a minimum of 75 cents per month.

Six lights and over require a meter.

Users of from 10 to 50 kw. get 20 per cent. discount; from 50 to 100 kw., 25 per cent.; 100 to 200 kw., 40 per cent.; 500 kw. and over, 45 per cent., if paid before the 15th of the month following and based, according to meter readings, at a rate of 7 cents per kilowatt hour.

Municipal Operations in Calgary

The city of Calgary, which now boasts a population of over 50,000 people, controls its own electric light, street railway and waterworks systems. These are in the hands of a commission, of which the Mayor is, ex-officio, chairman. The mayor is also commissioner-in-charge of the business management of the street railway system. Mr. A. G. Graves is commissioner of water and electric light.

Each of these departments shows a profit for the year 1910. The street railway, with a capital expenditure of $531,395, shows a gross reserve of $214,778, which, after all expenditures, including $9,370 for the sinking fund, $10,634 for contingent fund and $22,500 to the city's general account, leaves a net surplus of $33,315. Added to previous surplus this account now stands at $40,389. Mr. Thos. H. McCauley is general superintendent of the railway system.

In the electric light and power department the capital expenditure to date is $502,311, on which the year's gross earnings amounted to $193,099. Of this amount $18,200 is placed in depreciation account, $6,560 in a sinking fund, and $22,407 carried forward as surplus.

The waterworks department showed a net reserve of $3,335. The number of water consumers is placed at 4,616 and it is worthy of note that there were no arrears of payments on December 31st.

Nelson Raises Power Rates

The city of Nelson now finds that it has been supplying its citizens with power at about one-half what it has cost to produce. The rates, in consequence, will be considerably increased and will now be governed by the following schedule: First 100 kw. hours, 5c. per kw. hour; next 200 kw. hours, 4c. per kw. hour; next 400 kw. hours, 3c. per kw. hour; all over 700 kw. hours, 2c. per kw. hour; a minimum charge of $2 per month per horse-power will be made for each horsepower connected, and electricity for heating purposes will be charged at power rates.

Toronto Railway's Annual Statement

The annual statement of the Toronto Street Railway Company shows a surplus for the year just closed of $651,160. This is after a 7 per cent. dividend amounting to $560,000, a percentage of gross earnings to the city of Toronto amounting to $596,000, and all other charges, have been met. The total amount of surplus account now stands as $3,619,660.

The total receipts for the year amounted to $4,377,116, an increase of about 11 per cent. over the previous year. Operating expenses were 51 per cent. gross earnings. The total number of passengers carried in 1910 was over 109 millions, an increase over the previous year of between eleven and twelve per cent. The total assets of the company is now placed at slightly over 17 million dollars.

Port Arthur Street Railway

The operations of the Port Arthur Street Railway system for the year ending December 31, 1910, resulted in net earnings to the amount of $58,150. Gross earnings were $141,580, and operating expenses $83,430.

The manager informed the board that he is in communication with a firm manufacturing a hot air system of heating cars.

It is likely that four more cars will be purchased during 1911.

Manager Robinson has been reappointed for the current year and Mr. M. C. Wilson is secretary.

Ottawa Electric Railway Statement

The year ending December 31, 1910, was the most successful in the history of this company. Gross earnings were $748,708, an increase of $71,351 over 1909. Net earnings were $277,292, an increase of $79,374. The number of passengers carried was 16,989,334.

The Ottawa Railway Company probably holds the record for percentage earnings in Canada, if not on the continent, this year's net being in excess of 22 per cent. on the paid up capital. Following is the board of directors: Messrs. T. Ahearn, Peter Whelen, George P. Brophy, Hon. George A. Cox, Warren Y. Soper, and Thomas Workman.

Kaministiquia Power Annual Report

The annual meeting of the Kaministiquia Power Company showed gross earnings $191,283, an increase of $23,288 over 1909, with net earnings $162,543, an increase of $18,375. After fixed charges and a three per cent dividend were paid a surplus of $40,316 remained. Further enlargements to the plant will be necessary in the near future, according to President Holt. The officers of the company are: H. S. Holt, president; F. W. Thompson, vice-president; Sir Edward Clouston, C. R. Hosmer, J. E. Aldred, and F. H. Phippen. J. S. Norris is treasurer.

Winnipeg Electric Annual Statement

The gross earnings of the Winnipeg Electric Railway Co. for 1910 amount to $3,284,341, an increase of $661,000, or 26 per cent. over 1909. Surplus available for dividends amounts to $934,769, equal to 15.57 per cent. on stock, as against 14.39 during previous year. Passengers carried were 31,369,421, as against 26,382,733 last year.

Alberta Telegraph Extensions

Important extensions of the Dominion government telegraph line out of Edmonton into the north country are being planned by the Department of the Interior this year. It was only last year that the telegraph line was extended northwest from Athabasca Landing and brought into communication Lesser Slave Lake and Peace River Crossing.

This year extensions of the line will be made which will bring in the rapidly growing Grande Prairie settlement, where a town is springing up. This extension will be made south from Peace River Crossing, and gangs will be sent out early in the spring to forward the work. Another important extension is to be made along the banks of the Athabasca northeast from the Landing, to Fort McMurray, where settlement is also growing rapidly. Still another extension will, it is expected, be made out to Moose Lake, in the Saddle Lake district, about half way between the Saskatchewan River and Lac la Biche, a settlement that is very isolated, but where there are a large number of settlers. It is also said that an extension will be made to the Swan River settlement south and west from Lesser Slave Lake.

Legislature Endorses New Rules

A new set of rules governing the equipment and appliances required on locomotives, motors and cars used in the operation of tramway and street railway services in the province of British Columbia have just received the unanimous endorsement of the local legislature.

The rules for the most part are the same as obtain on the average tramway system, but also require "that every locomotive engineer, motorman and conductor shall pass an examination in regard to the proper care of the equipment, the handling of air-brakes, the train rules and regulations; must be at least twenty-one years of age, and undergo an eye and ear test by a competent examiner before being eligible for appointment in any of the above-mentioned positions."

Another important item requires that a safe distance be maintained between two cars going in the same direction. The rule reads that "cars must not approach within 150 feet of any car going in the same direction and on descending grades they must keep at least 200 feet apart."

Proposed Development on the Gasperaux River

A number of Montreal capitalists have secured control of the timber lands and water power situated on the Gasperaux river. They have had an engineer on the ground and have already begun preparations for developing the falls next summer. This water power is situated on the Gasperaux River seven miles from Kentville, in the Annapolis Valley, and engineers who have made an examination of the power say that there is 5,000 h.p., at all seasons, available.

The interested parties are endeavoring to secure by purchase the electric light plants at Kentville, Wolfville, and Windsor, and their intention is to supply the several towns and villages from Kentville west to Middletown, a distance of 30 miles, and east to Windsor, a distance of 27 miles, besides selling power to farmers along the route.

They intend applying to the Nova Scotia legislature for a charter at the coming session and beginning the development work this year as soon as the season opens up. Should this scheme be carried through as planned it will aid greatly in the development of the Annapolis Valley.

By-law to Permit Signs

Alderman Dandurand is introducing a by-law to the Montreal City Council to permit advertising by means of electric signs. In other cities these signs, he says, are a feature of street illumination, but in Montreal they are practically suppressed except on the tops of houses or for a narrow space up against a building.

By the new by-law it would be legal to have these signs project over the sidewalk for a distance of six feet and at a height of not less than ten feet from the level of the sidewalk. By the present regulation these signs cannot extend from a building more than twelve inches, for the reason it was thought that the signs would, as in the days of the old wooden affairs, be an obstruction to the view along the street. The modern idea is that the electric sign adds to the attractiveness of a city. The designs are practically endless and probably only Montreal, remarked Ald. Dandurand, has seen anything to object to in them.

However, at the present moment the city has not the requisite power to pass such legislation, but it will be included in the new charter amendments.

Storage Battery Cars on Trial in Toronto

The question of placing a trial storage battery Edison Beach car on Toronto's streets is being considered. City Engineer Rust and Electrical Engineer Aitken recently visited the Edison Beach factories and were favorably impressed with the equipment. The manufacturers have offered to send a coach on trial. Manager Fleming, of the Toronto Street Railway, has expressed his willingness to allow its operation on the company's lines. The point in connection with these cars about which there appears to be the most apprehension is the life of the batteries. The manufacturers have the greatest faith in their lasting qualities, but these have not yet been proven by actual operation.

If a trial coach is sent to Toronto and proves successful, it is very likely the suburban lines, to be built by the city during 1911, will be entirely equipped with them.

February Meeting Toronto Section A. I. E. E.

The February monthly meeting of the Toronto Section of the A. I. E. E. was held on February 10 in the Engineers' Club rooms, 96 King street west. A programme of unusual interest was the presentation of two papers describing two large hydro-electric installations; the first, that on the Matabitchouan river, near Cobalt, recently completed; the second, the municipal installation at Point du Bois near Winnipeg, rapidly nearing completion. Both of these installations have been in charge of the engineering firm of Smith, Kerry & Chace, and the papers were presented by members of this firm. The former installation was described by Mr. N. R. Gibson and Mr. A. L. Mudge, the Winnipeg plant by Mr. Gibson and Mr. A. J. Soper. Both papers were fully illustrated with lantern slides which indicated the marked skill and ingenuity with which these plants are constructed.

Regina Buys More Cars

The city council of Regina has placed an order with the Canada Ford Company for two double truck cars, complete with quadruple motor equipment and air brake, and for four single truck cars with double motor equipment, the cars to be built by the Brush Electrical Engineering Company, Limited, of London, England.

An Act Respecting the Ontario and Minnesota Power Company

A bill has been introduced in the Ontario legislature by the Hon. Mr. Cochrane, Minister of Lands, Forests and Mines, by which the Ontario and Minnesota Power Company, Mr. G. W. Bachus, president, is given permission to export temporarily an amount of electrical energy not exceeding six thousand horsepower, but shall keep one thousand horsepower, whether used or not, constantly available on the Canadian side. The price of power to be supplied, as demand requires, on the Canadian side, the conditions under which it shall be furnished, the method of distribution, and the time of delivery shall rest with the Hydro-Electric Power Commission of Ontario. Delay in complying with the commission's order shall render the company liable to a forfeit, as damages, of $50,000, plus $100 a day for such time as the delay continues.

The Legal P. A. Y. E. Car

Mr. W. K. McNaught has introduced a bill in the Ontario legislature specifying that all P. A. Y. E. cars operating in cities of over 100,000 inhabitants must fulfil the following conditions:

The car must have a rear platform at least seventy-two inches deep with a folding step not less than fifty-four inches long. The rear platform must be enclosed, properly heated and provided with a door or doors having an aggregate width of at least fifty-four inches, so arranged as to permit of the entrance and exit of passengers at one and the same time. If there is a partition between the rear platform and the body of the car such partition must have doors or openings so arranged as to permit of the entrance and exit of passengers at one and the same time. The front platform must be enclosed and properly heated. It shall be provided with an exit door at least thirty inches wide, and a folding step of the same width. If there is a partition between this platform and the body of the car it must be provided with an exit door or opening not less than thirty inches wide.

Combined Garbage Destructor and Electrical Plants

Consul Albert Halstead, of Birmingham, writes that there are now 80 plants in the United Kingdom for the conversion of garbage of cities into electric power, and that they are increasing at the rate of 20 a year. An English mechanical engineer calculates that there is a long ton of refuse for every 1,000 inhabitants, equal to about 300 pounds of steam per hour for nine hours per day, if destroyed in the properly designed destructor. A technical review of the subject has been compiled by Consul Halstead.

Letters to the Editor

Editor Electrical News,—

I have made some interesting experiments using carbon and tungsten lamps in the production of eggs. Hens must have light in the winter equal to that of spring and summer if they are going to lay equally well. If the number of hours they require to pick their food is reduced for the lack of light we cannot expect them to lay, as they need more food in winter than summer.

I have found that it makes a difference what color of light, as well as quantity, is used. I started with four 40 watt tungsten lamps which burnt from 4 p.m. to 1 a.m. The hens soon began to lay and were profitable though our rate is 17 cents per kilowatt. Not being satisfied with prosperity I changed the experiment and placed four 16 c.p. carbon lamps in place of the tungstens. These I burnt the same number of hours, and the hens stopped laying. I again replaced the tungsten lamps with the former result. The lamps were placed so that no shadow would fall on the ground. My hens roost nearly all day and lay at night. My coop is fairly warm although water will freeze in it.

If, among your readers, you have any other electrical poultry fanciers I would be pleased to hear from them.

F. K. Martin (Elec. Supt.),
Battleford, Sask.

Editor Electrical News,—

In storage battery practice one is sometimes confronted with the problem of removing a coat of lead sulphate from unformed lead plates or for that matter any lead utensil which it is desired to have clean of this compound. To clean a bunch of lead strips which had become (through accidental treatment with, first, a long bath in pure distilled water, and then, being thickly coated with lead hydroxide given another long bath in dilute sulphuric acid) well covered with lead sulphate I proceeded as follows:

First—I washed them thoroughly in water and then placed them in a strong solution of ammonium acetate and ammonium hydroxide made in these proportions—water, three parts, ammonium acetate one part and ammonium hydroxide one part (all by weight).

Second—After they were clean I washed them again in water and soaked them in a dilute sulphuric acid solution for thirty minutes.

The action in the ammonium acetate bath is very slow requiring about four days for completion. With an excess of ammonium hydroxide there was no noticeable loss of strength as a solvent after considerable use.

If the second operation is not carried on quickly and carefully, the lead will become recoated with sulphate as soon as it gets in the acid bath.

Paul F. Trout,
Tate Accumulator Company, Toronto.

New Plant for Winnipeg Electric Railway Co.

The Canadian General Electric Company have recently been awarded a contract for the supply of complete generating equipment for a new plant to be built by the Winnipeg Electric Railway Company within the city limits of Winnipeg. The prime movers will be high pressure steam turbines. The full equipment will consist of three, 3-phase, 4-pole, 3,000 kw., 1,800 r.p.m., 2,300 volt Curtis steam turbine generator sets, for operation condensing, with 180 pounds steam pressure at 125° F. super heat. These turbine sets will be complete with three turbine-driven exciters.

Another Rio Development

The Rio de Janeiro Government will grant the Bracuhy Falls and Metallurgical syndicate rights for the exploitation of the hydraulic power of the falls of the River Bracuhy, in Angra dos Reis, to be applied to the development of various industries, but especially mining and the manufacture of iron. The Falls of Bracuhy are about 3,000 feet in height, the estimate of energy available, with dams, is 100,000 horse-power.

Bonus for Good Record

The Interborough Rapid Transit Company, of New York, have recently installed meters on their coaches, by which the motormen may see exactly what amount of current they are consuming at different points on their trip. A noteworthy part of the system is the payment of a cash bonus of 25 cents a day to those men who show the best records.

High Tension Outlets used by Ontario Commission—A New Design for America

The accompanying photographs illustrate the two types of high tension line entrance and outlet conductors used by the Hydro-Electric Power Commission of Ontario in their 110,000 volt transmission system in southwestern Ontario. The horizontal type, figure 1, was manufactured in Germany by the Porzellanfabrik Hermsdorf firm, the vertical type by the Canadian General Electric.

The Hermsdorf type is in use only at Niagara. The

Fig. 1—Hermsdorf Outlets

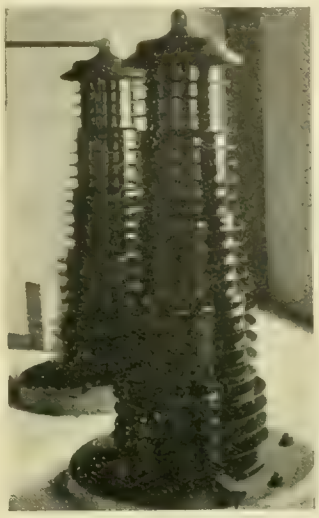


Fig. 2—C. G. E. Outlets

conductor in this type is a copper tube set in a porcelain tube some six feet long, surrounding which is a porcelain bushing about forty inches in length. There are four supports placed at right angles, as shown, each being a one-piece, corrugated, moulded porcelain, about two feet in length. The opening in the wall through which the outlet is made

Hermsdorf High Tension Outlets, Niagara

is five feet square. The corner openings are fitted with plate glass.

Under wet test these insulators withstood, without leakage, a pressure of 220,000 volts.

Pennsylvania Railroad Orders Nine More Electric Locomotives

Nine more electric locomotives, aggregating about 40,000 horse-power, have been ordered by the Pennsylvania Railroad from the Westinghouse Electric & Manufacturing Company. The new locomotives will be of the same type as those which are now being operated in the Manhattan Terminal, New York City, and will supplement the twenty-four already in use. The new locomotives will be completed by July 1st, 1911.

The cabs, frames, running gear and mechanical parts will be built by the Pennsylvania Railroad at their Juniata shops. The air brakes will be supplied by the Westinghouse Air Brake Company. The electrical equipments will be built and the complete locomotives assembled at the East Pittsburg Works of the Westinghouse Company.

The Pennsylvania locomotives are by far the most powerful ever built. The locomotive is an articulated machine of double cab design. Each half carries its own motor and complete equipment and the two halves are coupled together at their driving-wheel ends. The frames, driving wheels and trucks of the running gear are similar in general character to those of the "American Type" steam locomotive. The wheel and motor arrangement was decided upon only

Pennsylvania Electric Locomotive—Motors and Running Gear

after careful experiments with several other forms, both of motor drive and wheel arrangement; the governing motive being to secure the greatest possible steadiness at speed The coupled ends are fitted with permanent couplings of twin draw bars and friction draft gears, so arranged that the leading half serves as a leading truck and the other half as a trailer in whichever direction the locomotive may be moving. Each cab is complete with Westinghouse automatic and straight air brake equipment, apparatus for train lighting, electric head light, pneumatically operated whistle and sanders, as well as its motor, unit switches and master controller. The machines are so arranged that, in event of one motor being cut out, the entire machine can be operated from either cab with the remaining motor. The halves are interchangeable and if one is out of service it may be replaced by another half while repairs are being made. The unit switch field control permits two or more locomotives to be coupled together and all to be operated from either end of any one cab, and affords flexibility of speed and regulation. It gives two additional running notches and at the same time economizes power consumption during acceleration.

The following are some of the characteristic features

of the Pennsylvania direct-current, 600-volt electric locomotives:

Weights and Dimensions.

Weight of locomotive, complete, 156 tons; weight on drivers, 200,000 lbs.; weight on each driving axle, 50,000 lbs.; weight on each bogie truck, 57,000 lbs.; total length overall, inside knuckles, 64 ft. 11 in.; rigid wheel base of each half, 7 ft. 2 in.; total wheel base of each half, 23 ft. 1 in.; total wheel base of locomotive, 55 ft. 11 in.; diameter of drivers, 72 inches.

Pennsylvania Electric Locomotive drawing 8 coaches, Manhattan Terminal Station, New York

General Capacity.

Contract tractive effort, 60,000 lbs.; maximum draw bar pull (recorded on test), 79,200 lbs.; normal speed with full train, 60 mi. per hr.

Normal Service.

550-ton train to be started and accelerated on 2 per cent. tunnel grades—maximum contract horse-power, 4,000.

Motor Data.

Two direct-current interpole motors. Cast steel frames. Directly connected through jack-shafts and side-rods. Weight of each motor complete with cranks, 43,000 lbs.; height of motor frame above cab floor, 5 ft. 6½ in.; height of center of shaft above cab floor, 2 ft. 1½ in.

Since the opening of the Manhattan Terminal on November 27, 1910, the entire through passenger traffic of the Pensylvania Road in its Newark tunnels has been handled by the electric locomotives of this type without a hitch and to the entire satisfaction of the operating force. Very heavy trains far beyond the capacity of the usual passenger locomotive, have been handled over the tunnel grades with ease.

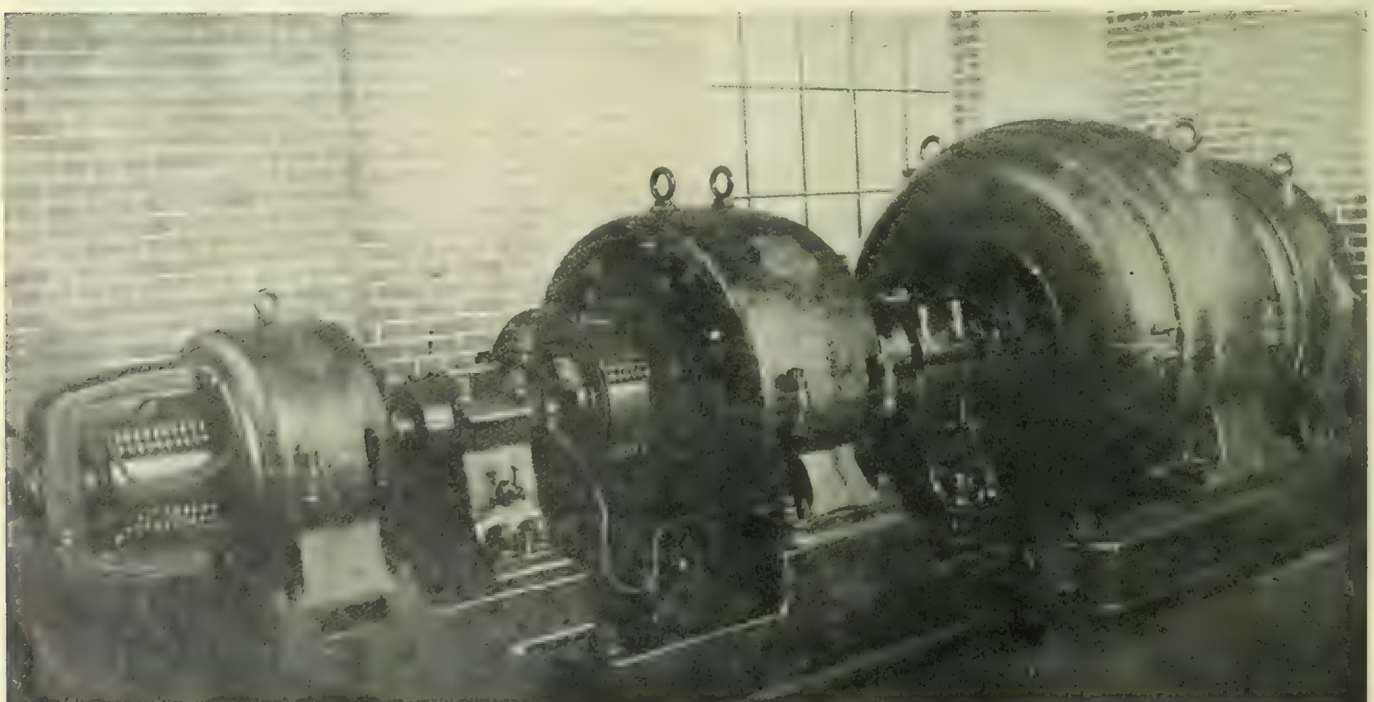
Light and Power Distribution in Guelph

Another City Using Niagara Power—The Causes that led to the Adoption of 60 Cycles—An Admirable System of Power Distribution

By E. Richards

The electric light and gas plants of Guelph have been municipally owned and operated since the year 1903 under the supervision of a Board of Light and Heat Commissioners, and when in 1909 the contract had been closed with the Hydro-Electric Power Commission for a supply of power from Niagara, the whole matter was placed in the hands of this board.

Owing to the anticipation, for a number of years, of



Motor Generator Set installed in the Transformer Station—Guelph

the final arrival of Niagara power, the Board had expended each year only the minimum amount on maintenance account.

The generating station was a decidedly old-fashioned combined steam and water power plant, driving a jack shaft to which were belted 125 cycle, 1100 volt alternators, series arc generators and one 500 volt D.C. generator. The

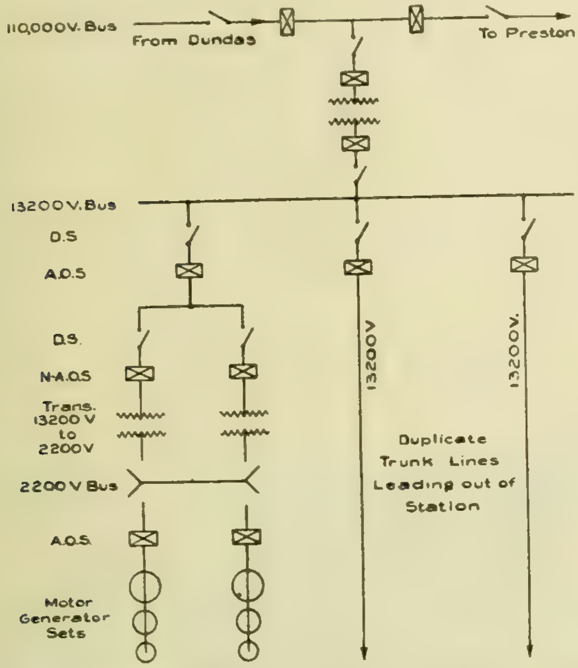


Fig. 1—Diagram of Main Transforming Station, Guelph

series open arc street lighting system was hopelessly antiquated and should have been replaced years before and the 500 volt D.C. power service could hardly be characterized as up-to-date even from a local standpoint.

The only part of the system that laid any claim to being called modern was the line transformer equipment. It consisted almost exclusively of the latest type of 60 cycle transformers of fair unit capacity. In addition the meters were all suitable for recalibration for 60 cycles.

The foregoing facts have been recited in detail because it is proposed to discuss at some length the considerations that led to the final choice of a general system for power and light distribution and it is deemed advisable to thus point out that the condition of the electrical system previous to its reconstruction for Niagara power distribution was not such as to justify the Board in considering this old system as a controlling factor in the general plan of rehabilitation to be adopted.

With these facts in mind it is proposed to point out and discuss, in the order of their importance, the factors which influenced the Board and its advisers in the choice of a lighting system, the choice as between 60 cycles and 25 cycles being made, practically the basis of the investigation.

First—The contract between the Hydro-Electric Power Commission and the municipalities provided for the payment of power on the apparent power basis up to a power factor of 90 per cent. and on the actual power basis in cases of factors above 90 per cent. This provision practically compelled the use of synchronous motors of a capacity sufficient to correct the power factor of the city's total requirements up to 90 per cent. In fact it was found that the reduction in power cost resulting from the use of synchronous motors would more than meet the fixed and operating charges on the same. The comparative figures in a concrete case will serve to illustrate this. Suppose the case of a motor load of 1,000 k.w. with a power factor of 70 per cent. and a lighting load of 300 k.w. with a power factor of 95 per cent. If this service were supplied exclusively by 25 cycles without power factor correction, the result would be as follows:—

Total load, 1,300 k.w.
Combined power factor, 76 per cent.
Total K.V.A., 1,715.
Payment made for 90 per cent. of 1,715 k.v.a., 1,543.

If the lighting load were carried by synchronous motor-generator composed of 500 k.v.a. motor and 300 k.v.a generator the result would be as follows:—

Generator load—300 k.w., 95 per cent. power factor, 316 k.v.a.

Motor load—550 k.v.a. (10 per cent. overload assumed).

Generator losses at 7 per cent.	22 k.w.
Motor losses at 8 per cent.	44 k.w.
Total loss	66 k.w.

Total energy component of motor load 300 + 66 = 366 k.w.

$\sqrt{(550^2 - 366^2)} = 410$ k.v.a. leading component of motor input.

This combined with power load shows—

Power	1000 k.w.
Light	366 k.w.
Total	1366 k.w.

Lagging component of power load, 1020 k.v.a.
Leading component from lighting set, 410 k.v.a.
Net lagging component, 610 k.v.a.
Total k.v.a. $\sqrt{(1366^2 + 610^2)} = 1495$ k.v.a.

Payment made for 1366 k.v.a., power factor being higher than 90 per cent.

Power paid for in first case	1543 k.v.a.
Power paid for in second case	1366 k.v.a.
Saving	177 k.v.a.
	= 236 h.p.

236 h.p. at \$9 (the price of power at Niagara Falls), = \$2,124 or interest, sinking fund and depreciation of 12½

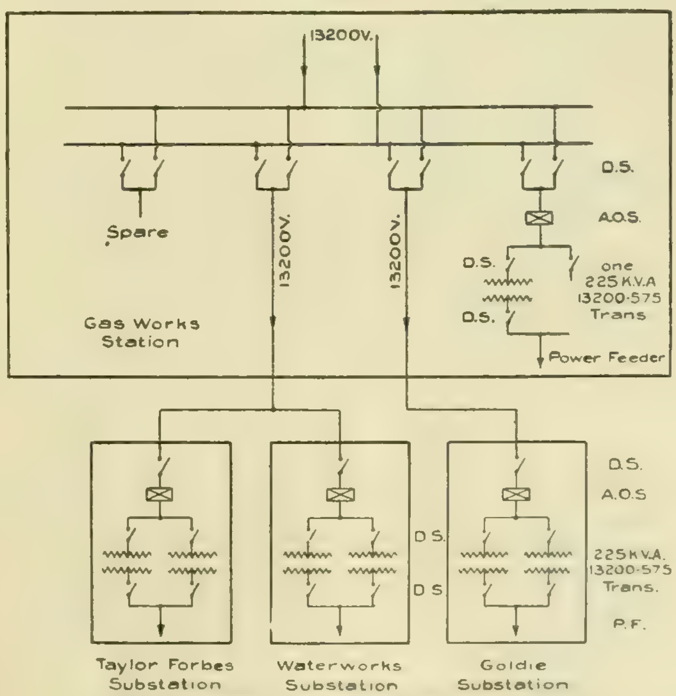


Fig. 2 Diagram of Power Stations, Guelph

per cent. on about \$17,000, or more than the cost of duplicate motor-generator sets.

Second—The regulation of high tension transformers and transmission line with constant voltage at Niagara

Falls, would, as the load increased, ultimately and possibly at the outset require either independent control of the voltage on lighting circuits by means of motor-generators or the use of voltage regulators with 25 cycle lighting. In the latter case good regulation on the lighting system would either require entirely separate lighting feeders or else the use of regulators of a capacity sufficient for the combined lighting and power load.

Third—The existing lighting, transformer and meter equipment could be all utilized for a 60 cycle lighting service but would have to be entirely scrapped if a 25 cycle lighting system were chosen. As between the relative

Gas Works Sub-Station, Guelph

capital expenditure under the two systems, there was, however, little to choose as the required investment for motor generators for 60 cycle lighting was approximately equal to that required for meters and transformers for a 25 cycle service.

Fourth—Considerable doubt exists as to the entire suitability of 25 cycle current for general lighting, especially in view of the increasing use of metallic filament lamps, and its inferiority for incandescent and other lighting is pretty generally admitted.

Careful study was made of the various considerations entering into the frequency question and the advantages and disadvantages of the higher frequency which seemed to present themselves are tabulated below:—

Advantages of 60 cycle system—

1. Synchronous motors are required and are available for power factor correction.

2. Superiority over other frequencies for lighting service.

Disadvantages—

1. Losses in frequency changer sets greater than in voltage regulators.

2. In case of general interruption to service considerable time is required to start motor-generators and restore service after 25 cycle supply is restored.

3. Motor-generators require attendance while voltage regulators may be quite automatic in their operation. As will be seen later, however, this disadvantage was practically eliminated.

The higher frequency was chosen under the circumstances as the most suitable.

To reduce operating expenses as much as possible, it was decided to install the lighting and street railway generating equipment in the hydro-electric transformer station so that one staff could operate the entire service.

Lighting System.

The lighting station equipment as mentioned above is installed in the service room of the Power Commission's transformer station. See Fig. 1. The power is taken from the 13,200 volt bus-bars through a Canadian General Electric Company's K_2 automatic oil circuit-breaker and two non-automatic hand operated condit oil circuit breakers to two 3-phase O.I.S.C. 13200-2200 volt transformers.

The motor generator sets are in duplicate and consist each of a 600 k.v.a. 4 pole 25 cycle self starting synchronous motor with a 300 k.v.a. 10 pole 62½ cycle generator on one end of its shaft and with a 200 k.w. 600 volt, interpole type, railway generator coupled to the other end. The exciter is in each case coupled direct to the outer end of the railway generator shaft.

The switchboard is of white Sicilian marble and consists of one exciter panel on which are mounted the exciter rheostats, the motor field rheostats and exciter control switches and instruments, two synchronous motor starting and control panels, two a.c. generator panels and two d.c. generator panels.

The only feature of particular interest about these sets is in the rotors of the synchronous motors. These are not of the usual projecting pole type, but the combined starting and exciting windings are wound in slots on the face of a laminated rotor like the field construction of certain turbo-alternators. Instead of starting as a squirrel cage induction motor, like all such motors designed on this continent, they start as slip-ring induction motors with single phase rotor windings. After running up to speed as induction motors on half voltage, the exciting current is switched on and then the motor is switched on to full voltage by means of interconnected or double throw oil switches.

Street Lighting.

It is intended to light the streets entirely by means of multiple lamps, and 100 watt lamps will likely be used throughout. Tungsten arcs are used at prominent intersections. For general illumination brackets carrying Wheeler

One of 3 small Transforming Stations

radial wave reflectors are used. On the main business street multiple arms are being designed to carry 100 watt tungsten lamps in opaque glass balls. These will likely be mounted on the trolley poles and provided with a satisfactory spring suspension for the lamps. The lamp circuits are controlled by series solenoid switches specially designed for the purpose and operated through the old series arc circuits.

This system of multiple street lighting, while not highly

efficient from a distribution standpoint, has very low capital charges in that its current is supplied from the secondaries of house lighting transformers. The switches, of which there are twelve in use, have never once failed, and the system as a whole is giving every satisfaction.

Power Distribution.

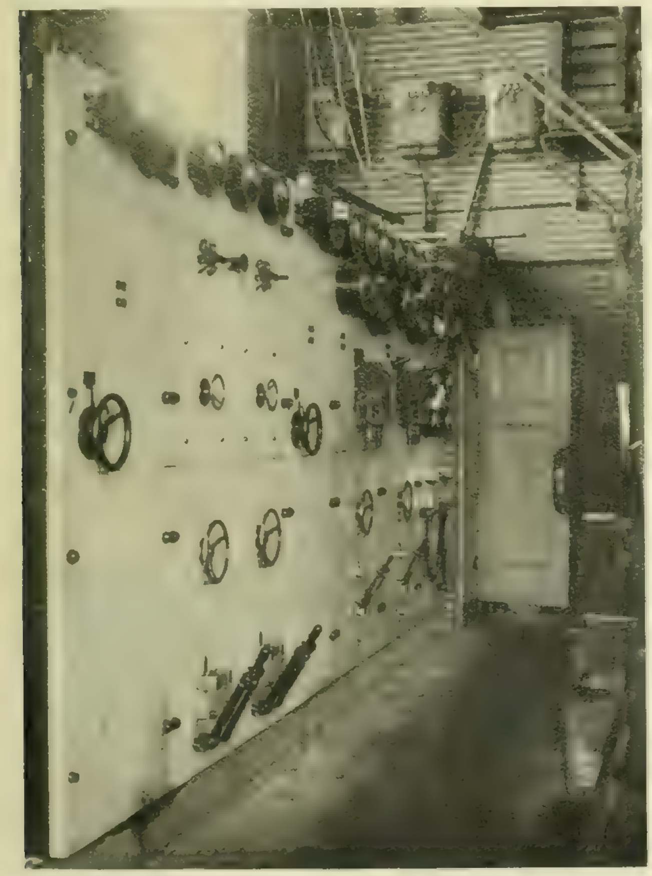
A number of factors determined the choice of the power distribution system, chief of which may be enumerated as follows.—

1. The main transformer station was located slightly more than one and one-half miles from the factory load center.

2. The factory load formed itself, largely, into four compact groups with centers about half a mile apart on the average.

Ease of interchange of factory motors demanded one standard voltage for all motors, and as 550 volts had been selected by the conference of the municipalities there remained no choice in this respect.

Consideration of the above led to the adoption of a 13200 volt distribution to the four load centers mentioned in 2 above. At these points are located small transformer houses with 550 volt distribution to the surrounding factories.



Motor-Generator Switchboard.

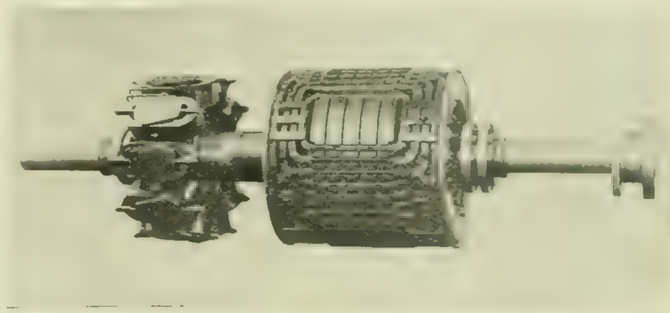
Fig. 2 shows in diagrammatic form the layout of the entire power system.

The combined switching and transformer house at the Gas Works is housed in a brick building. By means of the disconnecting switches in this station the two outgoing lines, one spare and the local transformer may be connected to either of the duplicate trunk lines from the main station. These trunk circuits are of No. 0 B. & S. bare stranded aluminum cable and the branch lines are of No. 2 stranded aluminum.

The three other transformer houses are of concrete slabs reinforced with expanded metal bolted to structural steel frames. Two of these stations have two three-phase 225 k.v.a. 13200-575 volt O.I.S.C. transformers installed at present. The primaries of these transformers are, in each case, controlled by a 15000 volt automatic oil circuit-breaker.

The City Owns the Motors.

A radical departure is being made by the Board in the supply of power to the various manufacturers in that they decided to purchase and supply motors to the customers. They adopted this unusual policy to expedite the installation of electric power in every case possible, to promote ease of interchange of motors with changing conditions of load, and to make possible a system of thorough care and inspection of motors. They felt, further, that expert supervision over the installation would enable them to choose a motor with higher efficiency and power factor than has been considered good practice under average factory conditions in this country. In the squirrel cage induction motor, the type in most general use because of its low cost and rugged character, certain construction and operating characteristics can only be obtained at the expense of others. High efficiency can only be obtained by the sacrifice of starting torque and power factor. High power factor can only be obtained at the expense of air gap and efficiency and by the use of the closed instead of the open-slot type of construction. Typical practice in this country has produced a motor with open slot construction to facilitate rewinding, and fairly high starting torque with its consequent lower efficiency and power factor. On the other hand, European practice has tended toward closed slot construction and higher efficiency and power factor.



Rotor of Synchronous Motor.

The Board was confident that with such expert supervision and care they could obtain these higher efficiencies and power factors and yet meet the average starting conditions, leaving special cases where high starting torque is required to be provided for by means of slipping clutch pulleys, slip-ring motors, etc.

The motors purchased and being installed range in capacity from 400 h.p. for a flour mill, down to 10 h.p., totalling over 1500 h.p.

Power Rates.

The rates for Guelph are as follows:—

1. $1.00 per month per h.p. of rating or demand.

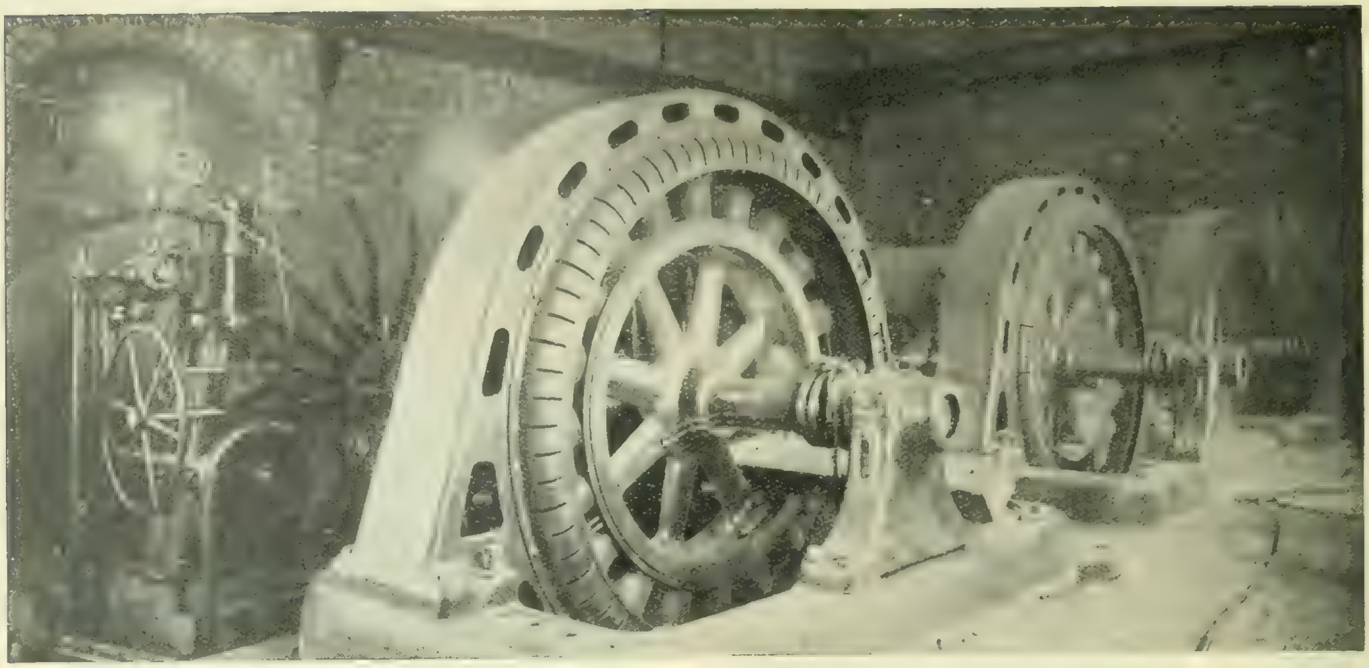
2. Meter rate on all energy consumed up to 150 kw. hours per h.p. of rating or demand as above, as follows:—

Up to 10 h.p., 1⅛c. per unit.
11-40 h.p., 1c. per unit.
41-100 h.p., ⅞c. per unit.
101 up, ¾c. per unit.

3. Meter rate of 2/5c. per unit on all energy consumed over 150 kw. hours per h.p. of rating or demand (150 kw. hours equals 8 hours use of each h.p.)

This will bring the price of power to the consumer, depending on amount taken, from $22 to $35 per h.p. per annum.

Ten per cent. discount is allowed for prompt payment of all accounts.



Three 950-kv.a. C.G.E. Generators just Installed for Sherbrooke Power Co.

Sherbrooke Plant Ready for Operation

4000 h. p. Will Be Developed—Solid Concrete Dams 300 feet long—Power Company Operates the Railway—The Home of the Jenckes Turbine

By James B. Woodyatt.

Sherbrooke is the third largest city in the Province of Quebec, and is the commercial centre of the Eastern Townships. It has exceptionally good railway facilities, and it is on the main line of the Grand Trunk Railway; is a divisional point on the Canadian Pacific Railway; the Canadian terminus of the Boston & Maine system, and the headquarters of the Quebec Railway Company.

It is the distributing centre for the now rapidly developing asbestos district to the north, the rich farming land of the Eastern Townships to the south and west, and the vast pulp limits to the north and east. Since the development of the mineral and timber resources of the district on a truly large scale, the population of Sherbrooke has increased very rapidly, and this fact is made very plainly evident by the opening of many new streets, and the great activity in the building trades. Situated about two miles to the south of the city is the beautiful residential town of Lennoxville, which is given ready access to the city by a line of the street railway, on which a very up-to-date service is maintained. Lennoxville has also the railway facilities afforded by the four roads mentioned above, and of late years several large industrial concerns have located there. The joint population of the two communities thus served by the Sherbrooke Railway & Power Company is now over twenty thousand. The Magog river draining Lake Memphremagog, a body of water thirty miles long, enters a deep and narrow gorge just above the city, and flows through the centre of the city, emptying into the St. Francis within the city limits. There is a municipal hydro-electric plant in the gorge supplying the city with a most efficient lighting service. After passing through the city's plant, the waters of the Magog are again utilized at two lower developments to operate the old plant of the Sherbrooke Street Railway, and several industrial concerns situated on its banks.

The new Sherbrooke Railway & Power Company, incorporated in 1910, took over the system of the Sherbrooke Street Railway, and acquired the water power rights on the Magog river between the municipal plant and the St. Francis river, giving a total available head of 63 feet, by which a minimum of 4,000 h.p. can be developed. By means of dams between the lake and the gorge the water in the lake can be held back during the flood period, thus providing a magnificent storage, by means of which a practically constant flow can be maintained the year round.

Sherbrooke is to the Province of Quebec what Hamilton is to Ontario, and it has long been felt that the one thing needed to make it a most important manufacturing centre was a plentiful supply of cheap power.

It was with this end in view that the Sherbrooke Railway & Power Company was incorporated. Development was commenced last summer.

The Development.

The new development combines the two old developments below the municipal plant, and the two old dams will be discarded. A new concrete dam was erected at the upper level, and the water carried by a large steel penstock to the new power house 650 feet below, thus obtaining a working head of 63 feet by which 4,000 h.p. will be developed.

About 800 h.p. will be required to operate the street railway with its contemplated extensions, and the remaining 3,200 h.p. will be available for industrial purposes.

The work on the power house and dam was completed some three months ago. This work was performed by the Bishop Construction Company, of Montreal, under the supervision of Messrs. Ross and Holgate, consulting engineers, who have had entire charge of the engineering work of the power company since its inception. The hydraulic installation, including penstock, standpipe and waterwheels, also the electrical apparatus, are now in place, and it is ex-

pected the plant will be operating before the end of February. The electrical machinery was manufactured and installed by the Canadian General Electric Company. The turbines are Jenckes' manufacture.

The Dam.

The new dam is 300 feet long across the gorge, and varies from 3 to 60 feet in height. The character of the rock at the bottom of the gorge, with a large island of solid rock in the centre of the stream, insures perfect anchorage and stability. The dam is built entirely of concrete, and consists of three sections: a bulkhead section 160 feet in length, a spillway section 110 feet in length, and a stop log section 30 feet in length. The bulkhead section is perpendicular on the face and four feet wide at the top, battering down on the back 4 to 1 for the upper 12 feet and 2 to 1 from there to bed rock. At about the centre of this section a large steel plate thimble, 13 feet in diameter, is let into it to convey the water into the penstock. Steel racks protect the hydraulic apparatus from debris, and in front of the penstock stop log checks have been placed, making provision for cutting off the water from the penstock in case of a breakdown. The stop log section on the other side of the spillway is provided to let out the water, should it ever rise to a dangerous height during flood time.

The Penstock.

The penstock is of steel plate 9 feet 6 inches in diameter carrying the water from the thimble in the dam, down stream 650 feet to the distributing section in the power house. The penstock is carried on reinforced concrete columns of varying heights spaced 16 feet apart, and suitably anchored at different points.

At the end of the penstock there is a large steel standpipe. This is 16 feet in diameter and 56 feet 6 inches in height, mounted on a solid concrete pier 22 feet above the tail water level. This brings the top of the standpipe 15 feet above the level of the head water, and with its large cubical capacity will reduce the strains on the penstock and water wheel governors to a minimum.

The Power House.

The power house is built on solid rock just above the point where the Magog river empties into the St. Francis. It is built

Switchboard—Sherbrooke Railway and Power Co.

of concrete up to the level of the window sills, and finished in red brick. The framework for the crane and trusses is steel. The main section, comprising the water wheel and generator room, is 110 feet long by 40 feet wide. To this will be added a gate house over the tail race, a transformer room at the down stream end, and an office section. A 15-ton travelling crane running down the whole length of the building will be part of the equipment of the power house.

Hydraulic Equipment.

The three main water wheels take their water from the distributor in the penstock through 66-inch motor operated gate valves. They are of the twin horizontal type, having a rated capacity of 1,325 h.p. each with three-quarter gate at a speed of 360 r.p.m. The water enters at one end of the steel plate casing and is discharged into the tail race through a draft tube

Two 100 h. p. Exciters—Sherbrooke.

22 feet long, inclined at 30 degrees to the vertical. The governing of these units is effected by Lombard governors of liberal capacity to insure a very close regulation. One of these wheels, tested at the factory at Holyoke, showed the very high efficiency of 85 per cent. at slightly over three-quarter gate.

The two exciter turbines, having a capacity of 100 h.p. each at 750 r.p.m., are of the single horizontal scroll case type. They will take their water from a common feeder opening from the standpipe through hand operated gate valves. They are controlled by Woodward governors.

Electrical Equipment.

This part of the installation has been carefully designed to conform with the best modern standards. The three main units have a rated capacity of 940 K.V.A. at 2,300 volts, 3 phase, 60 cycles, 360 r.p.m These generators are of rather special design in order to insure close regulation and absence of hunting. The rotors will have a weight of 24,000 pounds each, giving a fly wheel effect of 100,000 foot-pounds.

The exciters each have a capacity of 50 k.w. at 125 volts.

The power from the main units is taken to the switchboard and distributed to the local feeders, railway motor generator sets, and transformers for long distance transmission lines.

The power for the railways is obtained from two induction motor-generator sets having a capacity of 250 k.w. each at 500 volts. As in the case of the main units, these machines are of special design to meet the requirements of the fluctuating load of three single phase transformers having a capacity of 677 k.v.a. each.

The switchboard consists of 11 marble panels and will be equipped with instruments and protective devices of the most modern type to guarantee against breakdown, and to insure a constant and reliable service with good regulation.

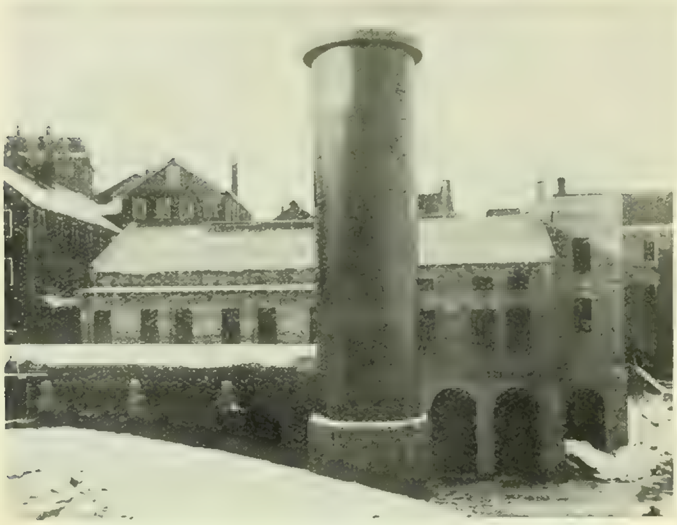
The power house equipment is protected from lightning troubles by electrolytic arresters.

Transmission Lines.

The charter of the company gives it the right to transmit and sell power throughout the St. Francis district. This will open up to the company a large district rich in minerals and timber, which has hitherto been greatly handicapped in its

development by reason of a lack of power. A very close study of the district has been made, and transmission lines will be run from the power house covering the district within a radius of thirty miles.

Already several large contracts have been made for power,



Power House—Sherbrooke Railway and Power Co.

and the transmission line has been completed as far as Capelton, a distance of eight miles. The line is carried on 35-foot poles spaced 100 feet apart. It is a single circuit at present consisting of three No. 4 bare copper wires, spaced 29 inches apart on one 8-foot crossarm, but provision has been made for a double circuit by a 4-foot crossarm being placed above the longer arm, by means of which a three-phase circuit can be carried on each side of the pole.

The Railway.

The street railway was built some twelve years ago, and while the traffic has been large and the returns good, it was

300 Foot Concrete Dam—Sherbrooke Railway and Power Co.

felt that they could be greatly increased by extensions and a general reconstruction of the system, the population of the city having doubled since the road was constructed. The present system consists of 7 miles of track, including the line to Lennoxville, sixteen cars, a freight car and a snow plow, car barns, power house, and office.

The old system will be entirely reconstructed and extensions run, making a total of about 13 miles of track.

The new steel is the 70 pound, 60 foot, 7 inch girder rail of the Lorain Steel Company. These will be laid on new ties throughout, held by tie rods and rail braces, and bonded with all-wire pressed bonds. All switches, frogs, and cross-overs have manganese steel centres.

About five miles of this new work has already been completed and preparations have been made to push the remaining work forward as soon as the winter is over.

Orders have been placed for eight new cars of the "Pay-as-you-enter," single end, cross seat type, and a new sweeper. Two of these cars and the sweeper have already arrived. These cars are equipped with two 50 h.p. motors, and with this equipment the running time will be greatly reduced on all routes.

To accommodate the new rolling stock, large extensions to the car barns will be made, and the shops and stores remodelled on a thoroughly modern plan.

Mr. N. C. Pilcher, formerly manager of the Fort William and Port Arthur Electric Railway is general manager of the company, and is assisted by Mr. Jas. B. Woodyatt.

Personals

Mr. Henry D. Bayne has been appointed special agent, in Toronto, of the Canadian General Electric Company and the Canada Foundry Company.

Mr. F. W. Prentice lectured on February 20 before the railway section of the Engineers' Club at 96 King street west.

Mr. F. W. Prentice.

The subject of the lecture was "Wireless Train Control." A lucid description was given of a clever system of train control, of which Mr. Prentice is the inventor.

Mr. P. D. Crerar, honorary-secretary Canadian Tungsten Lamp Co., and Mrs. Crerar have left for a two months' trip through Europe.

Mr. Alfred Landau, President Canadian Carbon Company, Toronto, has gone south for a few weeks' rest. In Mr. Landau's absence Mr. Winter, vice-president, is in charge.

Mr. J. H. Lockhart has resigned his position as assistant electrician of the Intercolonial Railway and engaged with John Starr, Son & Co. He will represent this firm in the Maritime Provinces in the electrical supply line.

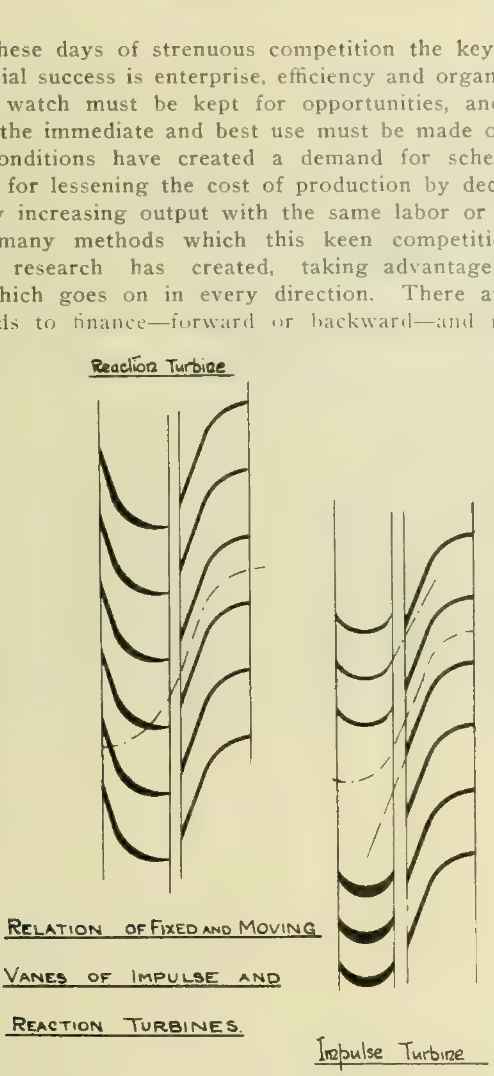
Mr. T. J. Lynch, well and very favorably known in Canadian business circles as the manager in Toronto of the Allis-Chalmers-Bullock Co., has left to assume charge of the Boston office of the Allis-Chalmers Co.

The Economy of Exhaust System Turbines

History of Turbine Briefly Described—The Rateau Design—Special Applications—Description of First Large Installation in Canada

By R. J. Maclean

In these days of strenuous competition the keynote to commercial success is enterprise, efficiency and organization. A close watch must be kept for opportunities, and when grasped the immediate and best use must be made of them. These conditions have created a demand for schemes or methods for lessening the cost of production by decreasing labor, by increasing output with the same labor or by one of the many methods which this keen competition and scientific research has created, taking advantage of the waste which goes on in every direction. There are only two roads to finance—forward or backward—and many a



RELATION OF FIXED AND MOVING VANES OF IMPULSE AND REACTION TURBINES.

business concern, by a keen application of these methods, moves forward right into the front line of commercial successes; its capital, heavily handicapped, is freed for investment to produce financial advance.

Amongst all the great strides made in every branch of engineering during the last few years, the turbine stands predominant, and in its latest role of exhaust steam utilization has beaten even its own record.

The turbine allows of the use of the lowest steam expansions, so filling a gap which the reciprocating engine has been unable to do, owing mainly to the tremendous cylinder areas necessary to deal with these immense volumes of steam, to the heavy corresponding friction and condensation losses, and last but not least, the impossible cost of production.

The low pressure turbine fills this gap perfectly. The high speed and continuous flow at which the steam passes through the cylinder results in normal areas, negligible friction and condensation losses, and a production cost competing with other power generators of corresponding sizes. What the Hon. C. A. Parsons did for the introduction and advancement of the high pressure reaction turbine, Professor Rateau has done for the low pressure impulse turbine. He appreciated the immense power losses connected with rolling mills, winding and other classes of intermittent engines, in fact any steam user running non-condensing. He saw the value and ease with which the turbine could be adapted to the utilization of these huge quantities of waste steam, and from experiments, observation and experience, he developed the Rateau system of exhaust steam utilization, which consists of a heat accumulator or regenerator, a turbine and condenser. Coupled direct to the turbine is a generator, blower, compressor or pump as required.

One of the greatest difficulties encountered was the great irregularities of the exhaust steam supply, especially when dealing with winding and rolling mill engines, which discharge many thousand pounds of steam for a few seconds and then suddenly stop. The ideal would be to take advantage of these sudden rushes of steam and store the excess heat in such a way that during the stops the turbine could draw on this reserve until the engine started again. This, Professor Rateau achieved perfectly in his exhaust steam regenerator, which receives variable fluxes of steam but delivers a constant one. The action is brought about by the variable heat absorbtion properties of water under different pressures. It is possible to store heat in metal and other materials by raising the temperature, but water has the highest heat capacity per unit of weight. These heat and pressure changes take place with extreme rapidity and the required pressure and temperature fluctuation may be regulated by the design of the accumulator and regulation of relief valves.

The steam passes into internal longitudinal tubes, perforated about 12 inches below the water level, and open at the bottom from end to end to allow of easy passage for the sudden rushes of excess steam. In its passage through these holes it creates a rapid circulation of the water, and having a higher temperature and pressure, loses its heat

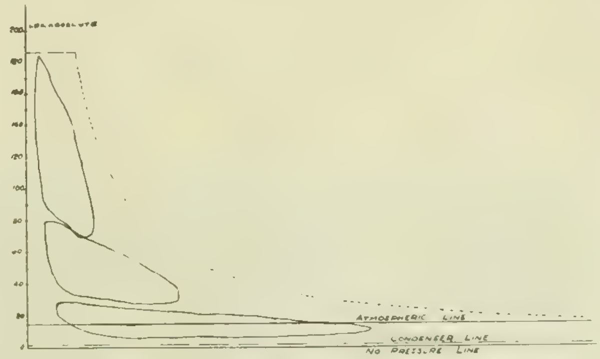


DIAGRAM FROM TRIPLE EXPANSION ENGINE

to the water. Now when the engine stops, the drop in pressure and temperature causes the water to give up its accumulated heat in the form of steam. Thus it will be seen that the accumulator is actually a heat fly-wheel storing heat when the pressure and temperature rise through the rush of exhaust steam, and giving it up when the supply stops, due to the fall in pressure and temperature, caused by the demand made by the turbine. The duration of regeneration depends solely upon the volume of water and difference of pressure.

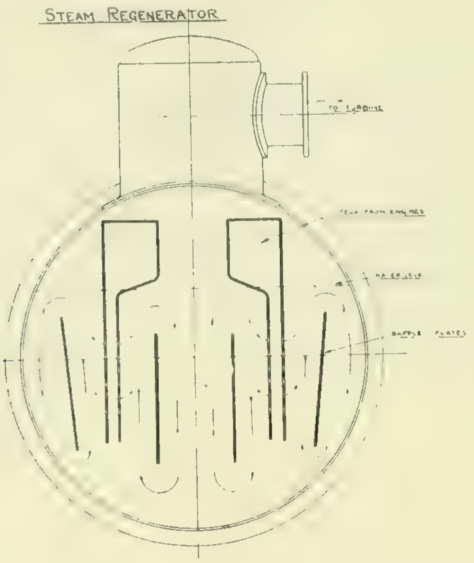
Where the exhaust steam supply is fairly constant and

in excess of the turbine demand (at its lowest pressure) the regenerator is quite unnecessary as in the case where the exhaust steam supply is from compressor and generating sets.

The earliest record of the practical use of exhaust steam by turbine was one made by two men named James Jemison Cordes and Edward Locke, who took out patents at Newport, Monmouthshire, England, in 1841.

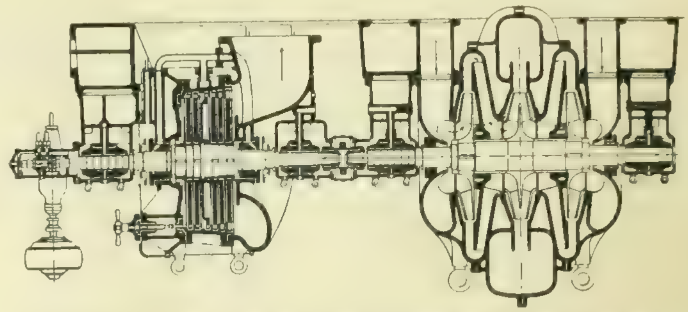
Special Applications.

A few remarks on the application of low pressure or exhaust steam to rolling mill engines may be of interest.



The work of rolling mill engines is of such a peculiar nature that the best results are obtained with single expansion, and the benefit derived from condensing is very little. A central condensing plant must be designed for the average load, which means that at the peak load it is heavily overloaded. To overcome this overloading the plant must be capable of dealing with the maximum quantity of steam which would mean an excessively large condensing plant. The consequence is, rolling mills usually exhaust to atmosphere, resulting in a very high steam consumption per horsepower. The amount of exhaust steam from this type of engine ranges from 15,000 to 40,000 pounds, or more, per hour.

Now we will take the larger quantity and see the most economical method of using it. The power obtainable from 40,000 lbs. at 100 lbs. guage of steam per hour in a high class engine by expanding from atmosphere pressure to 28 inches vacuum is about 3,500 horse-power, and from a rolling mill engine about 1,500 h.p. The temperature of steam at 15 lbs. absolute is 213 deg. F., and at 2 lbs. absolute is 126.3 deg. Fahrenheit. Thus for a difference of 13 lbs. in pressure the fall is 86.7 deg. F. or an average of 6.7 deg. F. per lb. drop in pressure, but from 150 lbs. absolute



Section through a Rateau Mixed Pressure Steam Turbine and Rateau Blower

to 2 lbs. absolute the drop in pressure per lb. is only 1.56° F.

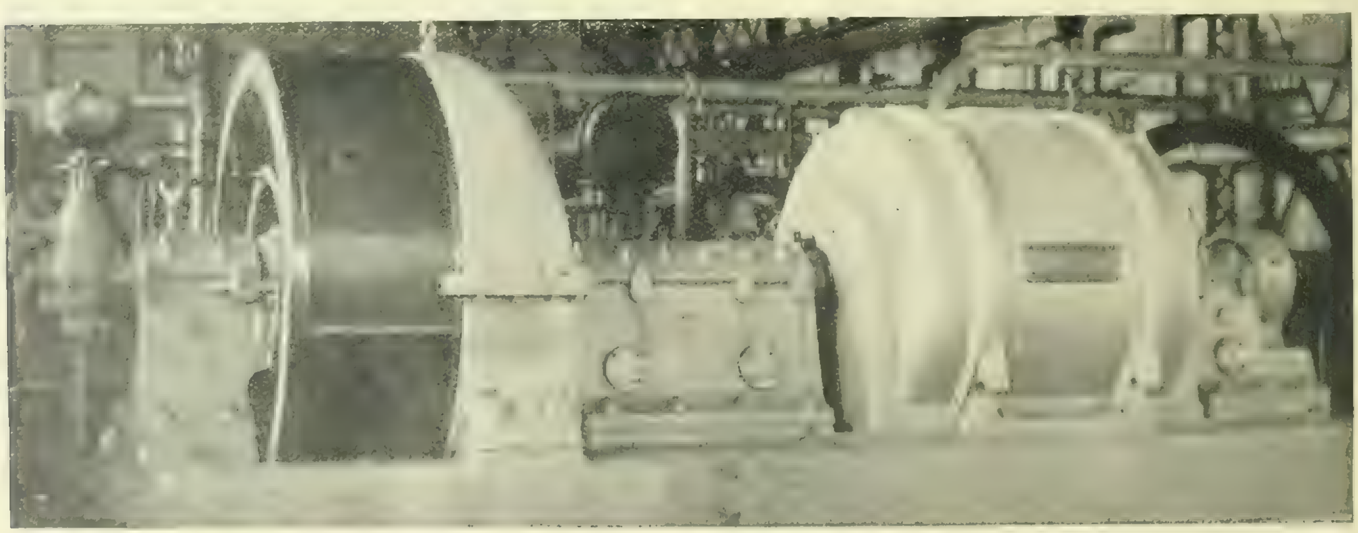
The curves taken from a triple expansion engine will show how incomplete is the expansion, and if this is the case in an engine of this class, it is an easy matter to imagine the loss in rolling mill engines, winding engines, etc. A glance will show how prohibitive would be a reciprocating engine capable of fully dealing with steam at that pressure and temperature. A low pressure turbine under exactly the same conditions would give efficiencies from 65 to 75 per cent. of the theoretically perfect engine.

Condenser and Turbine Compared.

A comparison between running the main engines condensing and exhausting into a low pressure turbo plant will show more plainly the benefit to be obtained. A saving of 15 to 20 per cent. may be obtained under the best conditions, by condensing. If we take 20 per cent., which is a high figure for this type of engine, the saving by an engine using 40,000 lbs. of steam per hour will be 8,000 lbs. of steam and a high speed reciprocating set consuming 15 lbs. of steam per h.p., will give an output of 533 h.p. on that amount.

If instead of condensing we utilize the 40,000 lbs. of steam through a turbine, we shall have, after a 20 per cent. deduction for condensation in pipes, engines, etc., 32,000 lbs. of steam available which at a steam consumption of 26 lbs. per e.h.p. will give 1,230 h.p., thus doubling the output.

There are one or two objections which may come to



1000 Kw. Low Pressure Turbo-Alternator Installed in No. 2 Colliery, Dominion Coal Co., Glace Bay.

the mind of the reader, so a reference to these will be helpful. (1) Back pressure on the reciprocating engines. (2) Condensation losses in accumulator and low pressure steam pipes. (3) Losses by using reducing valve to low pressure turbine.

1. The back pressure due to the addition of a low pressure plant is quite capable of adjustment to any desired pressure above or below atmosphere. The only alteration in pressure is due to the 13 inches depth of water through which the steam has to force itself. This means only about ¼ lb. pressure and if so arranged these accumulators can work at pressures below atmosphere. In the latter case the cost is slightly higher because the usual type of drains are not workable below atmosphere pressure, consequently

Air and Circulating Pump, Glace Bay

the drainage arrangements of exhaust steam pipes and accumulators require special methods.

2. Condensation losses caused by radiation of the accumulator and the connecting pipes never exceed 15 per cent. of the total steam and at that figure the steam has been carried by pipes some 150 yards from the source of supply to the turbine. This figure must of necessity include water that has passed from the high pressure steam pipes through the primary engine, so it is evident the pipe and accumulator losses are much lower than the above figure, in fact experiments prove the loss through the accumulator to be only from 1 to 2 per cent.

3. The steam consumption is 5 per cent. better when running on reduced live steam, than when on exhaust steam; this gain is due to the superheat and dryness of the steam caused by the wire drawing at the reducing valve. Reducing valves are not necessary with mixed pressure turbine, the full boiler pressure being automatically admitted to the high pressure end when the exhaust steam fails. The expansion of this high pressure steam is carried out right through the turbine.

The Rateau Turbine.

The first installation under this system was operated at Bruay Mines in the Pas de Calais in 1902, and is giving perfect satisfaction. Since that date plants have been installed in all parts of the world aggregating over 400,000 h.p.

The Rateau turbine is of the multicellular action or impulse type, the fall of steam pressure taking place solely in the distributors, the expansion being utilized in creating kinetic energy. As the steam pressure is the same on both sides of the moving wheels there is no tendency for the steam to leak past the tips of the blades, thus allowing ample clearance between the revolving and stationary parts. In the larger sizes the blade clearances in all directions are .25 of an inch.

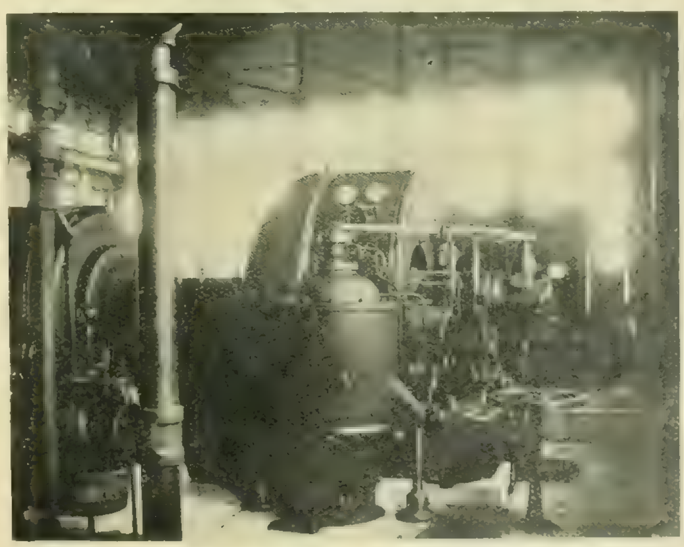
This greatly facilitates the construction and prevents the risks of blade stripping, which are greater when the clearances are fine. This is of great value when dealing with exhaust steam, which naturally contains much more moisture than steam at higher temperatures. There is practically no longitudinal thrust upon the moving parts, as the wheels rotate in a uniform pressure. An ordinary white metal collar thrust bearing is provided to keep the rotor in position and take up the slight end thrust due to the friction of the steam passing through the blades.

To further ensure against end thrust being caused by any unbalanced pressure between the two sides of each wheel, every one is perforated by four or six holes from 2 inches to 6 inches in diameter, according to the size of the wheels.

Every diaphragm is fitted with anti-friction metal bushes where the shaft passes through; this stops severe rubbing contact taking place on the shaft if by any chance it may touch, and so prevents sufficient frictional heat being developed to bend the shaft through unsymmetrical thermal expansion.

Two Units for Dominion Coal Company.

The Dominion Coal Company some time back made arrangements for installing two low pressure turbines at No. 2 Colliery, Glace Bay, for the purpose of utilizing the existing exhaust steam. The first of these has been running some three or four weeks, and an outlined description may interest the readers of the Electrical News. The Dominion Coal Company have a central electrical plant at their No. 2 colliery from which they transmit power to their surrounding collieries, the farthest being some eight or nine miles distant. This central station, which is a steel frame and brick building 210 feet long by 67.6 wide and 30 feet high, contains three generating units, each consisting of a Westinghouse 550 kw., 25 cycle, 3-phase 6,600 volt alternator, running at 125 r.p.m. directly coupled to a compound Goldie-



Governor Gear and Throttle Valve, Glace Bay

McCulloch horizontal engine. The high pressure cylinder is 20 inches, the low pressure 40 inches, and the stroke 26 inches; flywheel 14 feet and weighs 60,000 lbs. There are two exciters for these three units, each 75 kw., direct-connected to 12 x 12 Ideal engines. The air compressors in the building are: One Walker compound compressor steam cylinders 31 in. x 57 in.; air cylinders 32 in. x 51 in., stroke

60 in.; capacity 6,000 cubic feet of air per minute. Three Rand compressors compound steam cylinders 36 x 20, air cylinders 32 x 20, stroke 48 in., each delivering 3,000 cubic feet per minute. Two straight line Norwalk compressors. The total air compressing capacity is about 16,000 cubic feet per minute.

The first 1,000 kw. low pressure Adamson Rateau turbogenerator has been erected in this building near the other generating sets and can utilize the exhaust steam from any of these engines.

The three generating sets usually stand when the turbine is running, so that it does their work on the exhaust steam from the compressors.

The load being about 1,000 kw., the saving in coal can be easily imagined. As a matter of fact, before the turbine was installed, 16 water tube boilers, fired by underfeed stokers, had to be hard pushed to cope with the work; now 11 boilers handle it with ease and when the capabilities of the plant become better known there will be a greater reduction. The plant consists of a 1,000 kw. low pressure turbine running at 1,500 r.p.m. coupled direct to a Brown Boveri

Barometric Condenser, Glace Bay

alternator generating 1,000 kw. at 6,600 volts, 25 periods and .8 power factor. The four pole, 110 volts exciter is also direct coupled to the overhanging alternator shaft. The condenser is of the barometric self-draining type capable of dealing with 40,000 lbs. of steam per hour and maintaining a vacuum of 28 inches when supplied with 2,600 gallons of water per minute at a temperature of 70 deg. F. The vertical two-throw dry slide valve air pump and the centrifugal circulating pump are electrically driven by two Bruce Peebles 3-phase induction motors working at a pressure of 550 volts, 25 cycles, and a speed of 580 r.p.m. The air pump has a single reduction gear drive and the circulating pump a direct drive. A 24 inch pipe line conducts the circulating water from a large pond some 300 yards from the power house, to the pump house, from which the circulating pump takes its supply, delivering it to the condenser. The discharge water from the condenser falls down the barometric leg into the hotwell, from whence it flows over a weit and gravitates through a pipe line to the farthest end of the pond. This pond is of sufficient volume and surface area to keep the water below 70 deg. F. without cooling plant.

This plant is almost the first of its kind in the Dominion of Canada and the saving and results obtained under the actual working conditions will be of great interest, and when ready will be dealt with in the Electrical News. During the last year or two there has been a decided tendency to adapt compressed air below the surface in gaseous mines and turbines direct coupled to Rateau rotary compressors compressing up to 150 lbs. per square inch are quite numerous. For smaller power up to about 1,000 h.p., single reduction helical gear drives have proved perfectly satisfactory. In some cases these are running at a ratio of 20 to 1, which allows all the advantages of high speed rotary blowers and compressors combined with the slower speeds of electric motors, steam or gas engines.

Recent Publications

Metal Statistics—published by the American Metal Market and Daily Iron and Steel Report, New York; 208 pages, 3½ x 6 inches; bound in cloth. The 1911 edition of this work contains a larger and better selection of statistical information relating to the metal and iron and steel trades, than any of the previous issues, and the figures are presented in such a clear and concise form, that it provides a very convenient and complete reference. It contains important statistics covering the production, consumption and price movements of all metal products for a series of years, only such figures as have been proved reliable being included.

Reciprocity.—A trade treaty of 1854-66 between Canada and the United States; how it came to be negotiated and why it was annulled. Economic aspects of trade treaties in protectionist countries. By E. B. Biggar. Biggar-Wilson, Limited, publishers, Toronto. Price 10 cents.

The Development of Efficiency in High Tension Transmission Insulators.—By A. O. Austin. A paper read before the Electrical section of the Canadian Society of Civil Engineers.

Report of Analysis of Ores, Non-Metallic Minerals, Fuels, etc.—made in the chemical laboratories, Ottawa, during the years 1906, 1907 and 1908, arranged by F. G. Wait, M.A., F.C.S., Chief Chemist.

Recent Advances in the Construction of Electric Furnaces for the Production of Pig Iron, Steel and Zinc—by Eugene Haanel, Ph.D., Director of Mines, Ottawa.

The exploitation of our peat bogs for the production of fuel for domestic and industrial purposes—by Eugene Haanel, Ph.D., Director of Mines, Ottawa.

Announcement of a change in the value of the International Volt—a circular issued by the Bureau of Standards of the United States Department of Commerce and Labor. This circular outlines briefly the work of the International Committee on Electrical Units and Standards and announces that after January 1, 1911, the Weston normal cell is by mutual consent of the various countries to be taken as the equivalent of 1.01830 international volts at 20 deg. C.

Damage to chestnut, telephone and telegraph poles by wood-boring insects—by Thomas E. Snyder, M.F.—Bulletin No. 94 pt. 1, issued by the Bureau of Entomology of the United States Department of Agriculture. It is stated that the investigations outlined in this pamphlet have resulted in the determination of practical methods of preventing injury to poles by wood-boring insects. Illustrated.

Gray's Electric Water Heater

The Montreal Light, Heat and Power Company is exhibiting a novel electric water heater. In appearance it is a nickel plated cylinder about 18 inches high and 4 inches in diameter, surmounted by a small electric lamp and attached to the water faucet. The action of turning on the water lights the lamp, and heats a number of wires in the cylinder. These instantaneously heat the water as it runs from the faucet. Using 4 kw. an hour, at power rates, it heats the water to anywhere from 38 to 120 deg. F., according to the speed at which the water is regulated to flow. It is known as Gray's Electric Water Heater, and is manufactured by the company of that name in San Francisco.

Revelstoke Power Plant Nearly Completed

Municipally Operated System—Plans Laid for Future Extension—Diagrams Show Construction Work—Special Design To Prevent Frazil

By H. J. Haffner

About fifteen years ago a private company built the present power plant on the Illecillewaet River, about two miles west of the centre of the city of Revelstoke, generating there 125 kilowatt by water, diverted by means of a timber dam at the head of a canyon, down which a square flume was built for a distance of fifteen hundred feet, about half of which was under pressure, terminating in a steel casing in a wooden power house. On one side of this casing was a 500 h.p. Samson turbine designed to operate under a head of thirty-seven feet. The single phase belt-driven generator was next duplicated on the other side of the turbine and later a three-phase machine of 150 k.w. was installed on the same shaft to carry the power load. This plant was bought by the city in 1903.

On account of severe frazil and slush ice conditions peculiar to this turbulent mountain stream, it was decided, about five years ago, to install an auxiliary gas producer plant with a 125 h.p. engine, belt connected to the same shaft as the turbine. The turbine shaft operated at a speed of 275 revolutions, and the engine at 175.

Conditions on River

In the winter slush ice would sometimes block the Illeciliwaet for a distance of three miles to its junction with the Columbia and back into the tailrace, which was connected with the river by a short channel, and about eight feet above low water. The discharge of the river has a very large variation (as far as has been determined to date being estimated as high as forty to one). Owing to landslides and avalanches it is estimated that the discharge has been as high as twelve thousand cubic feet per second for a short time, while its low water flow is estimated to be as low as three hundred. The main line of the Canadian Pacific Railway is built in the north wall of the canyon overlooking the old dam and flume, and any proposed development had to keep the water level at flood at a safe distance below the rails. The scour of water over the old dam had eaten away a large portion of the schistose rock below the dam, undermining the timber apron and carrying away timber crib supports and protection for the flume immediately below the dam.

New Development

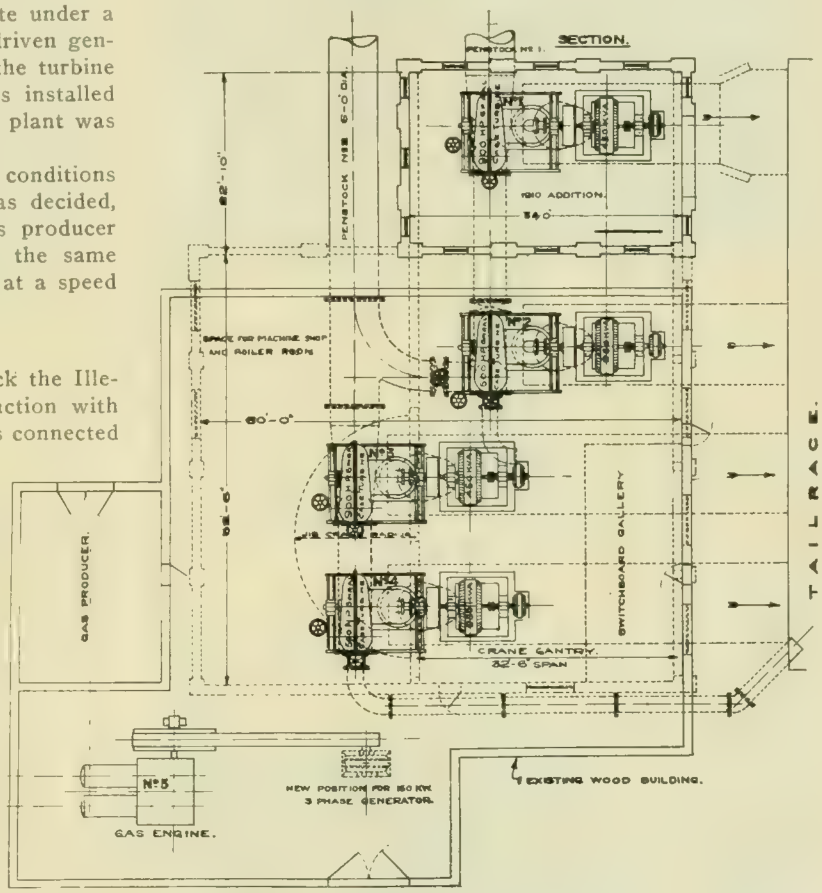
In November, 1909, it was decided to construct a new permanent dam at a point about two hundred feet below the old one on a reef in the bottom of the river extending between an overhanging canyon wall on the south and a solid rock point on the north side of the canyon. It was decided to build this dam to a height sufficient to create as large a pool as possible above for handling the frazil ice; to provide sluices to maintain a constant head at a safe distance below the railway, and to connect the power house and old machinery with a new six-foot wooden pipe line replacing the old flume.

It was later decided to raise enough money at the same time to install a new unit and change from a single phase to three phase current for distribution in the city, remodelling, as far as possible, the distribution system therein.

The accompanying plans show the dam as built with large construction sluiceway, blow-off for handling silt and anchor ice close to the rack bars, with an intake at right angles to the stream provided with two sets of rack bars and provision for steam heating of same in very severe conditions together with stoplog sluiceway taking the ice raked from the rack bars.

Power House Layout

The power house layout was designed to meet existing conditions and allow of gradual replacement of old plant without interfering with operation. The illustration shows the proposed development without any reference to the old plant except that the old power house is shown in full lines. The 1910 addition to the power house is of brick on concrete foundation, and the proposed extensions of this to take in the three additional units are shown in dotted lines. Penstock No. 1 was built to serve units No. 1 and No. 2, and the connections were so constructed that the blow-off at the end of the penstock could be moved when No. 2 was installed, and placed at the end of the penstock, while unit No. 2 will be connected to the penstock and No. 1 by 4 ft. pipe and gate valve.

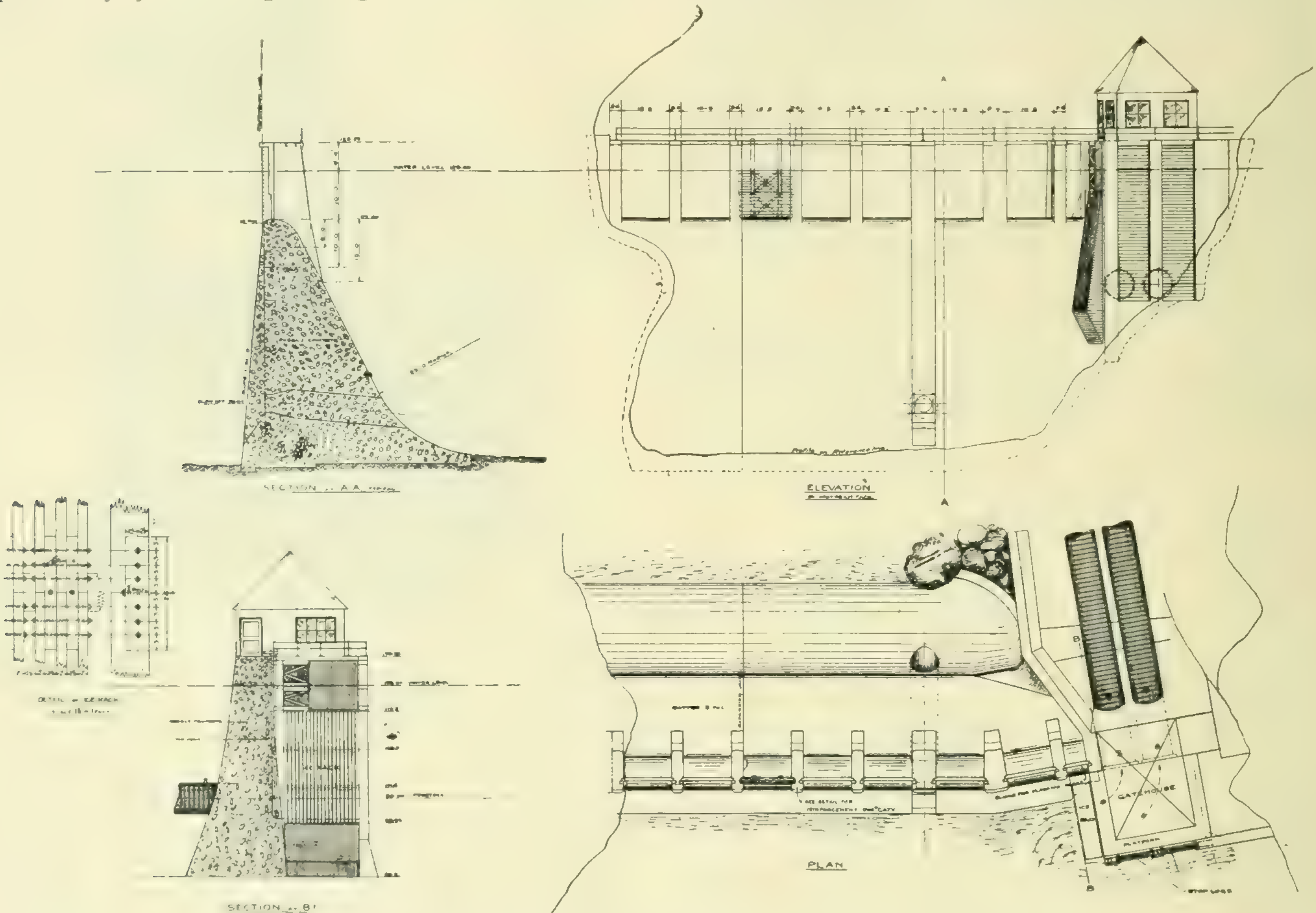


Showing Present and Ultimate Capacity Revelstoke Power House

No. 1 is gated from the penstock by 48" horizontal valve. The old flume enters the power house on the line of penstock No. 2 which will replace it and will serve units No. 3 and No. 4, which will be duplicates of one and two; and will, in addition, have a connection to No. 2. The next step in development will be the addition of penstock No. 2 and completion of unit No. 2 and units No. 3 and No. 4

may be added when the load increases. The 150 k.w. generator at present operating from the jack shafts from turbine or gas engine will be finally moved and belted direct to the gas engine as shown on plan. No details in regard to switchboard gallery, machine shop and boiler room have been worked out. Unit No. 1 has been built in a separate building and the new switchboard for it placed therein temporarily.

The old plant had a rated capacity of 400 k.w., 250 k.w. of which was single phase and 150 k.w. three phase. The old casing and turbine are still able to operate from the old flume, and a new 250 k.v.a. three-phase machine has been installed on the old foundations to replace the single phase machine, which will now be sold. Unit No. 1 consists of a 900 h.p. single runner spiral casing turbine, manufactured by The Jenckes Machine Company, direct connected to a 450 k.v.a. three-phase sixty-cycle Westinghouse generator with outboard and carrying that water and additional water diverted by the temporary flume through and over the site of the new dam, while the footings were being excavated and concreted in. Added to this, avalanches above, causing sudden rises and falls for which the stream is noted, and unusually high water during the winter, were a constant menace to the progress of the work. Water was diverted by coffer dam to the south side of the expansion joint and the central part of the dam built up to an elevation of one hundred feet between the expansion joint and the power and diversion flumes. These were built on the slide rock from the railway cutting above, and it was a difficult problem to carry them over the dam site. A concrete cut-off wall under the unwatering flumes was built on the line to the north wall. It was found impossible to complete this portion of the dam further, until the last thing in the spring, after the footings on the south side had been obtained by diverting the water by a second coffer dam into the 8 x 12 sluice above men-



Sectional Plans showing Large Sluiceway, Special Rack Design for Handling Frazil, etc.

exciter operating at a speed of 600 r.p.m. This unit was designed to operate under a head of seventy-three feet and carry the full lighting and power load. With overload this would carry the normal increase of the city lighting, and some additional power, for another year or two. The balance of the plant was designed to operate as an auxiliary until the old flume was useless, at which time penstock No. 2 would be built and connected up with a new turbine to 250 k.v.a. unit, which will then complete unit No. 2. The other extensions have already been explained.

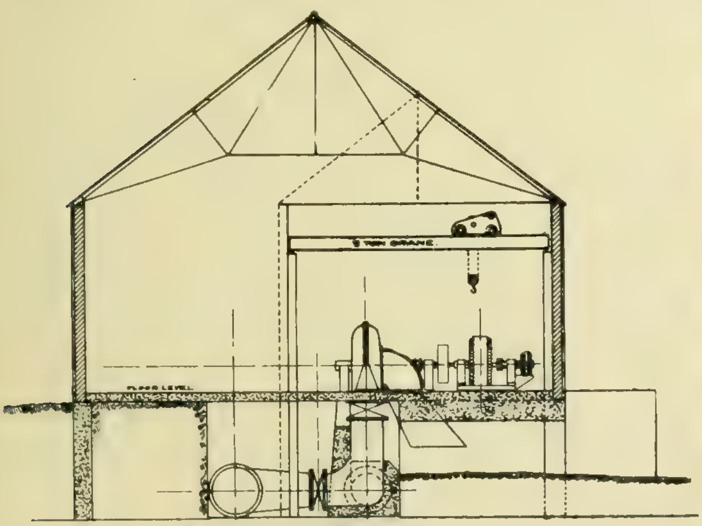
Construction of Plant

The construction of the dam in the canyon was interesting and difficult owing to the fact that the work had to be done during low water in the winter time with only limited time for completion, and the difficulties which obtained due to necessity for keeping the present power plant running tioned. Serious delays when this stage of the work had been reached caused grave apprehension that it would not be possible to complete the dam before high water; and it was necessary to carry on the work with this possibility in view so as not to jeopardise the safety of the supply of power for the city until high water had subsided. A short shut down of the power plant was necessary when the power flume was cut, and the footings under the lower rock slide, immediately below the railway track on the down stream side of the dam, were being excavated and concreted. This work it was necessary to push forward in the early spring, night and day. Twice the water rose in the river filling the 8 x 12 sluice and threatening to get beyond control. Finally the new penstocks were built in and the north and south sides raised alternately to the level of the central completed portion. The gate-house was under construction

when a flood, the result of hot weather, caused a rise of twenty feet in the water against the dam in one day, brought down a large amount of old crib and loosened the old power flume. This driftwood was forced against the incompleted gate-house pier, bending the steel and rendering its completion before the floods doubtful. The water poured over the incompleted dam to a depth of three feet, and it will be remembered that at this time the 8 x 12 sluice was under a head of thirty-five feet, and the large 18" timber-gate, designed to close it and turn the water over the top of the dam, had not yet been placed in the groove which was prepared for it. This was an anxious time for everyone concerned, and when the water subsided on the second day, gradually falling again to within six feet of the top of the sluiceway, it was decided to endeavor to force the bulkhead into place. This was accomplished by loading it with rails and letting it go with a run. It fell to within eighteen inches of the bottom of the opening and the water was successfully turned over the top of the dam. This it had been decided to leave for the summer incomplete, but sufficiently high to take the water through the new penstock, which was then connected with the old flume, and operation under water power again resumed. It was unfortunate that is was found impossible to complete the gate-house at that time, and the gate to the 8 x 12 sluiceway had to be blown out during the next low water period and the gate-house foundations built in the dry. The dam withstood the summer floods, in spite of its incomplete condition and flat crest, showing little sign of wear. The crest and piers have since been added, and it is expected that the gate-house will be completed, the bulkhead again put in place and the full head be put on the dam by the time this article appears.

Concrete Construction Work—Revelstoke, B.C.

The River Banks are of Solid Rock



Present and Ultimate capacity of Power House

On account of the location of the 6-ft. wooden stave pipe-line, above the old flume along the foot of the railway embankment, its construction, without interfering with the operation of the old flume, was difficult and expensive. On it there are a number of sharp curves, as shown in the illustration, one of which is less than one in fourteen. The timber in the flume is Douglas fir, kiln-dried, and is of the very best quality. Both it and the sills are painted with preservative coat of asphaltum paint. This part of the work was done by day labor.

On the pipe-line are one-way poppet valves, a mandoor at the lower end, and a relief valve on the turbine casing just outside of the power house, discharging into the tailrace.

Design of the Dam

The design of the dam is interesting, in view of its location upon a micaceous schistose rock on the north side, which was seamed with quartzite and very treacherous and faulty, which in the centre of the stream came in contact with a later intrusion of more evenly laminated layers of diorite. This south wall of the canyon was precipitous, its top overhung the base about twelve feet. The dam was located on the roof connecting the two walls and given the form of an arch upstream by the bend in the dam near the north end. In this way, and taking advantage of the position of the wall on the south side, it was possible to lighten the section of the dam, to take the penstock out at right angles to the abutment and at the same time obtain

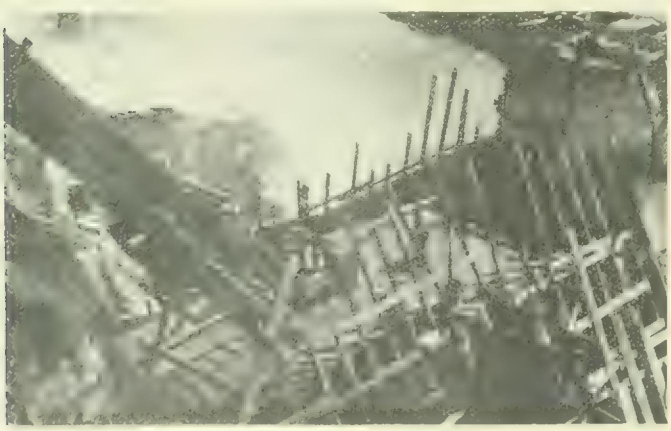
Construction Work—Revelstoke, B. C.

a suitable angle for the rack bars in reference to the current.

The structure was built with the least expenditure possible and to this end the favorable location in reference to gravel and rock and ability to handle these by a compact and overhead traveller, were advantages not often obtained. The Illecillewaet is one of the most difficult streams of the province to handle in flood, due to the immense amount of silt carried in suspension, and the large quantities of logs

Pipe Line Running parallel with Flume

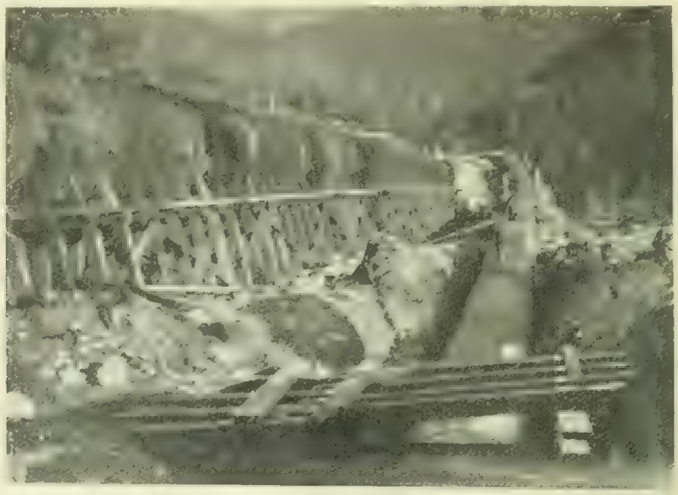
which come down the canyon. It is intended to handle these latter by booms in the pond above. The most difficult problem in design was to obtain satisfactory sluices at a minimum cost which would satisfactorily permit of quick operation and maintain a constant head during flood. The location of the dam in the canyon so situated in reference to the railway track and with no possibility of enlargement of spillway area, without tunnelling on the south side, had to be met by construction of gates which could be lifted clear—were not too large—and yet would permit of passage of drift through them over the crest. The piers, therefore, had to be made as small as consistent with strength and are heavily reinforced with the best steel obtainable. The



Construction Work on Dam, Revelstoke, B.C.

full head in low water will not be required for some years, and until that time the sluice-gates will not be installed in all of the openings.

The handling of the frazil ice was, as above indicated, one of the chief points in design, and the gate-house with the rack bars will indicate the method adopted. Water is taken in between eight and twenty-five feet below the surface, and the rack bars are situated so as to take advantage of a minimum amount of water to flush the accumulated ice through the 4.5 ft. sluiceway. The blow-off is situated at the foot of the rack bars under a head of forty feet and



New 6-ft Penstock on Right, Revelstoke, B.C.

will handle small amounts of anchor ice and keep them clear of silt.

Unit No. 1 is now in operation under a head of sixty feet.

The plant was designed and built by Smith, Kerry, Chace and Haffner, engineers, through their Vancouver office. The contract for the dam was let to William Newman & Co., of Winnipeg, and for the powerhouse to E. C. Fromey, of Revelstoke.

Manitoba Power Company's Extensive Projects —Have Closed Contract with St. Boniface

Within the next two or three months the E. B. Reese Engineering Company, Winnipeg, will be in the field for a large amount of central station and other electrical equipment. This company, of which Mr. E. B. Reese is the chief, is the present representative in Winnipeg of the Manitoba Power Company, a group of Montreal capitalists.

A contract has been secured to supply the city of St. Boniface with electrical energy, which the municipality will in turn retail to consumers as well as supply its own needs. At present the municipality uses about 3,000 horsepower and it is expected that with the rates secured they will be in a position to compete directly with the Winnipeg Electric Street Railway Company to supply various large industries which now secure their energy from other sources. Special inducements will be offered manufacturers to locate there and the power will be supplied at cost, laid down.

In addition to this contract the Manitoba Power Company is negotiating for a number of franchises in the province with the intention of operating along the lines of the Ontario Hydro-Electric Commission—that is, to supply small towns and villages and individual consumers along their transmission lines. Negotiations are now in progress for permission to run a line of electric railways through the municipality of St. Vital, and this line will ultimately be continued through to the North Dakota boundary, serving a rich and well-settled country.

The Manitoba Power Company has also acquired the various charters held by the Rural Railways Company, and it is the intention to develop these, giving a wide and complete system of radiating railways out from Winnipeg.

Though the plans have not yet been completed for the development they have advanced to a stage where a general

idea is possible. The company has secured from the Dominion government the rights to develop Big Bonnet, or Great Falls as it is sometimes called, on the Winnipeg river. The initial development will be 21,500 k.w., but this will be increased with the demand to the full capacity of the falls, 75,000 h.p. The first system will call for about 300 miles of high tension transmision lines, probably carrying current at 120,000 volts, three-phase and thirty cycles. The high tension wires will be carried on bridge type towers of a modified design especially suited to the nature of the country to be crossed.

In the distribution, the high voltage will be tapped off at three or more substations, being sent out at a voltage of 13,000 on the radiating distribution system. The voltage supplied to St. Boniface has been contracted for at 2,200 volts, 60 cycles. Low voltage current will be supplied to small consumers in the agricultural districts.

A feature of the contract with St. Boniface lies in the fact that energy must be delivered to them by November 1, 1912, and a bond of $250,000 will be entered into for the completion of the contract.

In order to fulfil the terms of the contract and save the forfeiting of their bond the company must use all haste in the completion of their plant and nothing will be permitted to stand in the way. At the power site there is a considerable amount of granite rock to be removed and a dam about 18 feet in height is to be erected. Ready access to the work is possible, for the company has secured the charter for a short line which will run from Lac du Bonnet station on the C. P. R. immediately to the site. In consequence there will be no trouble in transporting material anad supplies.

The rates to be paid by the city vary from $18 if less than 5,000 h.p. is taken to $15 if 15,000 h.p. or over is required. The city is to build and operate its own substation. If so required the company will build and operate the said station but will charge $2 per h.p. extra.

Trade Publications

The Thomas Meter.—An electrically operated meter for indicating, integrating or graphically recording the quantity of flow of gases. Issued by the Cutler Hammer Mfg. Co., Milwaukee.

The Dionic Water Tester.—An apparatus for measuring by electrical means the quantity of impurity in water. Written by S. Evershed, M.I.E.E., and distributed by Vandeleur & Nichols, Canadian representatives Evershed & Vignoles, London, Eng.

The Kellogg Switchboard and Supply Company have just issued the second edition of their bulletin No. 32 on Cord Circuit Practice for magnetic switchboards. This book has proven very popular with telephone men operating small and medium size exchanges, giving as it does real practical information on cord circuit equipment. This bulletin is issued uniform with bulletin No. 54 on party line equipment.

Electric Hoists.—Bulletin No. 1445 by the Allis-Chalmers Company, Milwaukee, describing the various accessory parts of their well-known electric hoists. Well illustrated.

The Edison Storage Battery.—A booklet compiled by the Edison Storage Battery Co., of Orange, N.J., and distributed by their Canadian agents, Canadian Vehicles, Ltd., Toronto. Descriptive of the Edison cell in all its parts with the many uses to which it may be put

The O-B Company Bulletin.—Issued every two months by the Ohio Brass Company, Mansfield, Ohio. The present issue contains interesting articles on extruded ears, high tension insulators, couplers, etc.

Elevator Controllers.—A booklet describing the line of electric elevator controllers developed by the J. L. Schureman Co., of Chicago and now manufactured by the Cutler-Hammer Mfg. Co., Milwaukee.

Allis-Chalmers Direct Connected Reynolds Corliss Engines.—Bulletin No. 1510, illustrating and describing their heavy-duty engine of this pattern.

The One Working Part arc lamp and lowering gear—catalogue No. 125 issued by the London Electric Firm, Croydon, descriptive of their large variety of arc lamp lowering devices. Illustrated very fully.

Flexlume Day-Night Signs.—1911 catalogue, isued by the Flexlume Sign Company, St. Catharines. A number of prominent installations in Toronto and elsewhere are illustrated.

National Electric Lamp Association.—Bulletins on Electric Sign Lighting, Mazda miniature and low-voltage lamps and tantalum multiple lamps.

Reynolds Electric Flasher Mfg. Co.—Bulletin and price list No. 3, issued by this company from their offices at 191-193 Fifth avenue, Chicago, descriptive of two of their popular flashing effects, the Reco Script type and the Reco Chaser type.

Inter-Comm-Phone.—Booklet issued by the Stromberg-Carlson Telephone Company, describing their different types of inter-communicating telephones for residences, offices, factories, banks, hospitals, etc.

Electric Controlling Devices.—Catalogue issued by the Independent Electric Manufacturing Company, of Milwaukee, descriptive of a number of their various electric controlling devices, including rheostats, regulators, controllers, starters, switches, etc. Price lists attached. Well illustrated.

Graphic Recorders.—The Sangamo Electric Company, Springfield, Ill., are distributing bulletin No. 22, describing their portable and switchboard type graphic recorders. Several pages are devoted to a discussion of the application of graphic recorders to soliciting power, checking input of electrically driven machines, etc. The bulletin is very complete and should prove of assistance to central station managers confronted with the day load problem.

Westinghouse Nernst Lamps.—A contractors' handbook issued by the Nernst Lamp Company, of Pittsburg, from their Toronto office, descriptive of their various types of lamps, chandeliers, clusters and renewals.

Canadian General Electric Co.—Pamphlet No. 187 on Rosettes, and No. 188 on Porcelain Sub-bases for metal moulding; also Condulet Talks 138 and 139.

Light Your House by Electricity.—A pamphlet issued by the Canadian General Electric Company describing a complete electric light system for a dwelling house.

Condulet Talks.—Nos. 142 and 143, also pamphlets descriptive of "Keyless Sockets for Large Base Lamps" and "Porcelain Cleat Receptacles," distributed by the Canadian General Electric Company.

Victoria city council is contemplating a rapid extension of the ornamental lighting system now installed on Douglas and Yates streets. Over 400 new standards will be ordered. The cluster lights will replace the arc lamps now in use, and will be so connected that every alternate lamp may be cut off after midnight.

Plans are being prepared by B. C. E. R. Company engineers for the construction of extensive freight terminals on the north shore of False Creek, Vancouver. The waterfrontage was acquired several years ago, and the foreshore rights have now been secured.

Telephone News of Canada

Manitoba Extensions.

Many improvements and extensions are contemplated by the Manitoba Telephone Commission this year. A request for $2,000,000 to carry on the work will be submitted to the legislature at the forthcoming session. Since opening the Garry exchange the main offices at Charlotte and McDermot streets, Winnipeg, have been found inadequate for the accommodation of the provincial and city business of the commission and it is therefore decided to erect a two-storey office building adjoining the main exchange on Portage avenue east so the local staff can be moved out of the main offices. A new stores building will be put up on Henry street at a cost of $40,000, with a special C.P.R. railroad siding. The present stores building will then be converted into a headquarters for the construction department, where all the staff employed in installing, moving and repairing the system in this city will be found. The stores building is an important feature of the system as it is necessary to carry $250,000 worth of stock and material to supply the demand growing out of the development of the business in Winnipeg and the province.

There were 3,300 telephones added to the system last year, an increase of over 25 per cent. This brings the actual number in use up to about 35,000, as against 14,500 when the property of the Bell Company was taken over. Chairman Paterson, of the commission has stated that if this growth continues this year it would necessitate the immediate construction of underground cables, overhead cables and all the necessary appurtenances to provide for the new business, all of which would mean an expenditure of nearly $600,000.

The long distance service also needs attention and the commission has under consideration plans for the extention of the lines and extra copper circuits to cost $250,000. It is possible at present to talk to points as far east as Windsor and Detroit and an effort is now being made to have the governments of Manitoba, Alberta, and Saskatchewan get together on a line that will connect Calgary and Vancouver.

Work will shortly be commenced on installing the switchboard in the new building in the north end, at Burrows avenue and Salter street, and when the job is done better service will be insured for subscribers north of the C. P. R. tracks and Elmwood.

Exclusive Clause Struck Out.

In the city of Sherbrooke there are three telephone companies operating, the Bell Telephone Company, the Canadian Telephone Company, and the People's Telephone Company; the two latter operated and maintained by local capital. A contract was recently entered into between the Bell Company and the Canadian Company, giving the former exclusive rights over the latter's lines and incidentally shutting out the People's Company. The matter was brought before the Board of Railway Commissioners, which rendered judgment ordering the striking out of the exclusive clause.

The People's Company are now making application to the Quebec Utilities Commission to force the Canadian Telephone Company to give them connections. The People's Telephone Company are operating about 600 miles of wire and about 1,200 telephones. The Canadian Telephone Company also operate about 600 phones. The application states that the Canadian Company has no objections to making the required connections, but wants the order from the Board on account of some promise or understanding between them and the Bell Company.

Train Despatching by Telephone.

A considerable extension to their telephone train despatching system by the C. P. R. will be undertaken this year, authority having been given for the equipment of 1,528 additional miles. This will make a total of 3,782 miles, covering the lines from Kamloops to Calgary, Medicine Hat to Winnipeg, Fort William to Ottawa and Brockville, Sault Ste. Marie, Mich., via Sudbury to Toronto, Windsor to Smith's Falls, the St. Thomas, Port Burwell and St. Mary's branches, Montreal to Quebec, Montreal to Newport, Vt., and St. John, N.B., and the Temiskaming branch.

The following table shows the mileage at present equipped with the system:

	Miles
Megantic to Farnham	132
Newport to Montreal	114
Toronto to London	115
London to St. Mary's, St. Thomas and Point Burwell	114
Chalk River to Cartier and Temiskaming branch...	289
Muskoka to Sault Ste. Marie	312
Cartier to White River	269
White River to Fort William	251
Winnipeg to Brandon	133
Brandon to Broadview	132
Broadview to Moose Jaw	135
Moose Jaw to Swift Current	111
Swift Current to Medicine Hat	147
Total	2,254

Telephone and Telegraph Rates in Switzerland.

The general use of the telephone and telegraph in Switzerland is due to the fact that excellent facilities for communication are provided. Practically every post office in the country is provided with a public telephone and telegraph, and every community, no matter how remote, is supplied with both services. Rates are low, and every inducement is offered to the public to use the telephone and telegraph as means of communication.

The telephone rates to subscribers for each call, for a conversation lasting three minutes, are as follows: Within the city, town, or community in which the phone is located, 1 cent; interurban calls, not exceeding 32 miles, 6 cents; not exceeding 64 miles, 10 cents; exceeding 64 miles, anywhere in the country, 15 cents; for night service the last three divisions are 4, 6, and 9 cents, respectively.

The telegraph service is also inexpensive, the rate being 6 cents for each telegram and half a cent per word, making the cost of a 10-word telegram 11 cents, or 16 cents for a 20-word message.

The cost of administration of the telegraph and telephone service for the year was $3,222,000, and the receipts $3,223,000, leaving a balance of $1,000 profit to the government

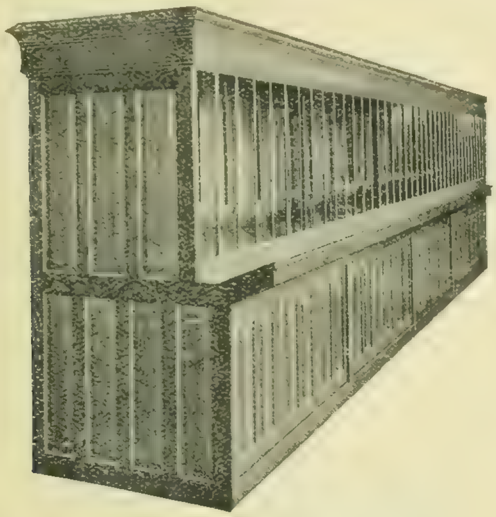
New Brunswick Telephone Company.

The New Brunswick Telephone Company has just completed improvements costing about $15,000, which have been made during the past few months by a corps of linemen. Cables have been installed throughout the city of Fredericton on the streets used to any extent for wires, while a conduit is now in use on Queen street. A new submarine cable has been laid across the St. John river between the city and St. Mary's, and the new and old poles in the city have been straightened and made ready for painting

A Large Magneto Installation.

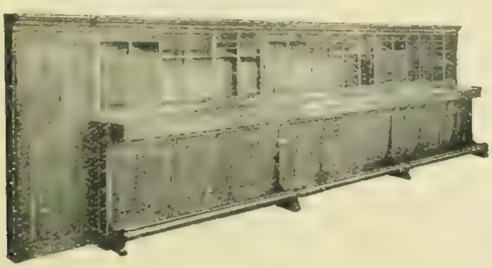
Among the many common battery exchange systems installed recently by the Kellogg Switchboard & Supply Company, the 11 section 10,000 line capacity exchange for Sao Paulo, Brazil, is of special interest on account of its size and importance. This system is to be used first as a magneto multiple lamp signal switchboard, but it is so designed that it may be changed to a common battery system without discarding any of the original apparatus. The present equipment is 4,960 lines.

The handsome, massive quartered oak board, illustrated herewith from photograph taken just previous to packing, will be equipped for 31 operators' positions, each to have 15 universal cords with ring back keys. This company has furnished complete accessory apparatus, including intermediate distributing frame, terminal clips, for 4,960 lines on ans-



wering and multiple side. The relay frame is for 5,400 subscribers' lines. The main distributing frame is equipped with 4,960 Kellogg arresters and terminal clips for 6,250 outside lines. There is to be one two-position chief operator's desk and one one-position wire chief's desk.

The complete operating plant will be made up as follows: one set of 11 storage batteries; 2 motor-generator charging sets operated from 220 volts, 60 cycles, 3-phase, alternating current; two ringing machines with howler attachment, one to operate from the battery and the other to



operate from the primary battery circuit; one white Italian marble power switchboard.

A slight change in the wiring at the relay rack is all that is necessary to convert the magneto line to a common battery line. The cord circuits as furnished are of the universal type and will automatically adapt themselves to line conditions.

Another interesting installation of the same company for the city of Chihuahua, Mex., is a complete exchange with an ultimate capacity of 1,800 magneto multiple lines.

Central Canada Telephone Company.

A newly organized company called the Central Canada Telephone Company, composed of Montreal and Toronto capital, has been formed, which will construct and operate a telephone line from Fort William to the Manitoba boundary line, forming a rural and urban system.

Welland County Telephone Company

The fifth annual meeting of the Welland County Telephone Company held recently in Bridgeburg showed that during 1910 over 100 phones had been added to the system, which brings the present total to more than 600. There are now over 120 miles of pole line and over 400 miles of metallic circuit. A 5 per cent. dividend was paid for the year 1910 as compared with 4 per cent. the previous year. The old directors were re-elected.

Miscellaneous

It is reported that Engineer Hays, of the Provincial Telephone Commission of Manitoba, is strongly in favor of installing automatic telephones in Winnipeg, the chief obstacle being the greater expense of installation.

At the thirteenth annual convention of Associated Boards of Trade of Eastern British Columbia, recently held in Creston, a resolution was adopted advising the provincial government to take over all telephones and provide long distance connections.

Windsor has been connected with Winnipeg, by telephone, via Detroit. The connection between Windsor and Detroit is by cable..

The British Columbia Telephone Company is now issuing a monthly magazine, "Telephone Talk." The first issue, that for January, contains a quantity of matter that will be of much interest to employees of the company and its many patrons. The cover has a picture of the Vancouver general exchange, while a reproduction of the first central switchboard in Vancouver in 1887, typifies the wonderful growth of the company's business since that time. A fine halftone picture of the late Dr. J. M. Lefebre, father of the British Columbia Telephone Company, adorns one of the front pages of the magazine.

British Columbia Telephone Company linemen are stringing a new connecting wire between New Westminster and Blaine, Wash. Two lines already connect the two cities, but the growth of business demands increased facilities.

Telephone connection between Rankin and Pembroke, Renfrew County, will soon be a reality, Reeve Greer, of Wilberforce, and Mr. Jos. Davis, being the moving spirits in the construction of a line between these points. The rural telephone movement is spreading rapidly among the farmers of Renfrew county between Pembroke and Beachbury.

Mr. Charles J. Leacock, construction engineer of the Stratford Light and Heat Commission, has been appointed supervising engineer for the Hydro-Electric Commission, for Stratford, St. Mary's, Mitchell, Seaforth, Tavistock and surrounding points.

Mr. A. B. Wilson, who has been connected with the Tungstolier Company, Conneaut, Ohio, for the past two years as their St. Louis representative, has been made vice-president and general manager of the Tungstolier Company of Canada, Limited, with their general office at Toronto, Canada.

Industrial Progress

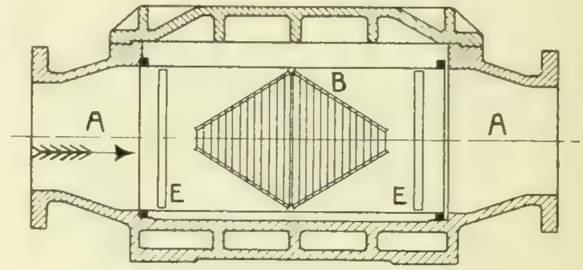
An Electrically Operated Gas Meter.

A new gas meter has just been invented by Professor Carl C. Thomas, head of the Department of Steam and Gas Engineering of the University of Wisconsin. The meter is the commercial outgrowth of a very thorough and extensive laboratory investigation of the specific heat of superheated steam which Prof. Thomas has carried on for a number of years. It is of interest to electrical men in that it is electrically operated.

The principle of the Thomas meter is exceedingly simple, as seen from the accompanying sketch, which represents a cross-section of the meter casing, and constitutes the portion of the apparatus inserted in the pipe line carrying the gas, or air, to be measured. In the center of this meter casing is an electrical heater and on either side of the heater are screens of fine resistance wire which are called "thermometers." These two screens constitute in reality, two arms of a wheatstone bridge and variations in temperature between these two screens, resulting in variations of resistance, cause a galvanometer needle to swing to the right or left of a central point, this movement of the galvanometer needle resulting in increasing or decreasing the amount of electrical energy fed into the heater.

The meter is so adjusted at the start that a fixed difference of 2 deg. F. between the entrance temperature and the exit temperature of the gas or air is maintained. Let us assume, for example, that a weight of gas or air equivalent to 50,000 cubic feet per hour is flowing through the meter and that the entrance temperature of this gas or air is 60 deg. F. The amount of electrical energy required to raise the temperature of this quantity of gas, or air, 2 deg. is known, and the meter is so adjusted that a requisite number of watts will be supplied to the heater installed in the meter casing. So long as the flow of gas, or air, remains unchanged the watts input will continue the same, but if more gas flows, the meter will be called on to supply more watts, and, conversely, if the flow of gas decrease the watts input will also decrease. Hence, what the meter really does is to measure the watts input, which can be done with exceeding accuracy, and since the relation between a certain watts input and a certain flow of gas is known, it is possible to tell at any time the amount of gas flowing, by merely noting the watts input. As a matter of fact, the recording mechanism of the meter translates watts input into standard cubic feet of gas, so that you can get a direct reading without calculation of any kind.

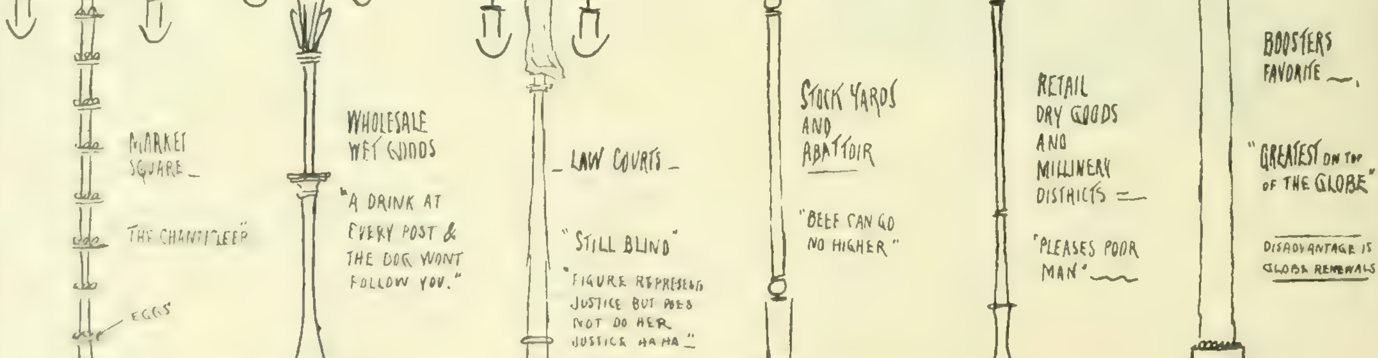
The meter will measure gas or air at any temperature and at any pressure and is not affected by fluctuations of pressure or temperature. This is because in heating gas or air we have to do with weight, not with volume. Whether a pound of air occupies 10 cubic feet or 100 cubic feet the amount of electrical energy required to raise its temperature



Diagrammatic View of Meter Casing with Heater (B) and Thermometers (E) in place

2 deg. is the same, and whether it is moving rapidly or slowly through the meter, a pound is a pound, and in raising its temperature 2 deg. just so much energy will be required, and no more. The meter deals only with a temperature difference of 2 deg. If the gas enters the meter at 60 deg. F. its temperature will be raised to 62 deg. F. If it enters at 100 deg. F. its temperature will be raised to 102 deg. F., so that as stated above, neither temperature nor pressure have any effect on the accuracy of the meter's measurements.

The Thomas meter is essentially a machine for measuring the heat energy required to raise the temperature of an unknown weight of gas, through a known range. It consists of two parts, a heater unit (installed in the pipe line) and an automatic device for maintaining a constant temper-



A Large Canadian City is Considering Suitable Designs for Ornamental Street Poles

ature difference. Electrical energy is used as the source of heat because electrical energy can be measured more accurately than can any other quantity. Electric resistance thermometers are used to maintain the known temperature difference constant not only because they are very sensitive and accurate, but also, because they can be very easily made to regulate the heating energy so as to correspond to the flow of the gas.

The meter is applicable for measuring either illuminating gas, natural gas, blast furnace gas, compressed air, or air flow in ventilating or forced draft systems.

A New Type of Graphic Recording Meter.

One of the objections in the use of graphic meters has been that the construction usually adopted has been more or less delicate and the elements are quite easily thrown out of adjustment. Messrs. R. C. Lamphier, of the Sangamo Electric Company, Springfield, Ill., and H. W. Young, of Chicago, have developed a type of graphic recording meter which is a radical departure from the forms heretofore employed. Several different forms are manufactured, shunt type, two and three-wire d.c. ammeters and wattmeters; series or transformer type, two or three-wire single phase wattmeters for use on three or four wire, two phase, or three phase circuits. In each type the record is made on a paper chart ruled with rectangular co-ordinates and driven by clockwork mechanism. The movement of the recording pen across the chart is proportional to the quantity measured and the speed of the record chart is controlled by a driving clock. The switchboard, or permanent mounting form is shown in figure 1. The measuring elements consist of two mercury floated motor elements so located as to actuate a common indicator to which is attached a recording pen which traces a line or curve on the moving chart. The principle employed is the same in all forms, the only difference being in the type of winding or magnets employed. This construction insures a uniformity and interchangeability of product which is highly desirable. In addition to the recording feature each meter is provided with an indicating scale, thus rendering unnecessary the use of indicating ammeters or wattmeters. The portable type, illustrated in figure 2, employs the same elements as the switchboard form with exception of the case and arrangement of binding posts or terminals.

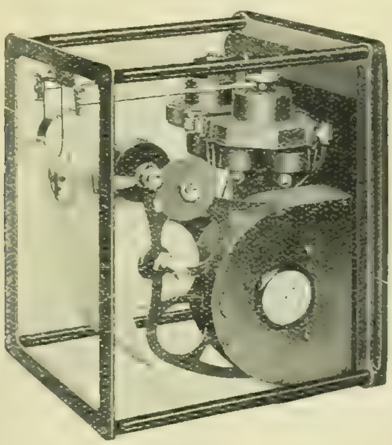


Fig. 1

Each meter is provided with two measuring elements which may be separately energized as in polyphase wattmeters, three wire direct current and alternating single phase; or may be connected in series or parallel for use on two wire direct current or single phase alternating. The moving element consists of a simple metal disk or sector rigidly attached to a shaft carrying the recording pen mounting and control springs. The moving disk is floated in a mercury chamber which not only serves as a conducting medium for the current to be measured, but also by the damping action of the disk passing through the mercury renders the meter indications aperiodic or dead beat. Surrounding the moving disk is a magnetic field generated by electro-magnets in the alternating current meters and direct current wattmeters, the latter being operated from shunts. Permanent magnets are employed in the direct current ammeters. The magnetic field of the fixed elements is in such relative position to the moving system or armature that it cuts or passes through the armature field and tends to rotate the moving system. This rotative movement causes the recording pen to move across the chart against the restraining force of the control springs which tend to return the pen to zero position. The turning force of the mercury floated moving element is thus balanced against the sustaining force of the control springs and their point of balance or equilibrium is a measure of the current flowing in the measuring coils. With this construction therefore is secured the three essential elements, a turning and restraining force and a means of indicating or recording the current or energy value.

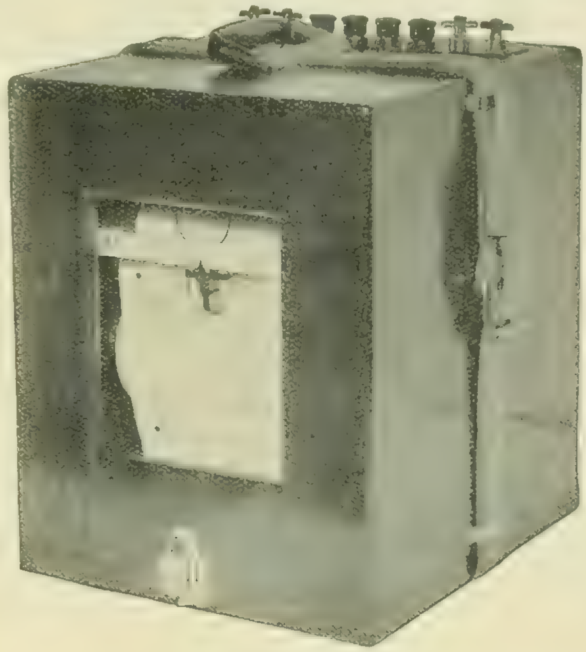


Fig. 2

The use of mercury suspension in a non-spillable chamber is claimed to be a decided improvement in design and to have the advantage of enabling meters to be shipped and installed without the necessity of making complicated or difficult adjustments as it is simply necessary to fill the pen and start the driving clock. The absence of bearing or jewel trouble combined with the simplicity of installation is of importance to users in that the ordinary station operator can install and care for the meters without the assistance of an expert. As the meters are of the direct deflection type the use of relays, control magnets, contacts, etc., are avoided. The construction adopted also secures a "torque" or turning moment higher than has been heretofore attained. This torque, in conjunction with the minimum friction value of the mercury floated moving element, gives a ratio of "torque to weight and friction" of such value that errors due to pen friction on the chart are said to be entirely eliminated.

Trade Enquiry

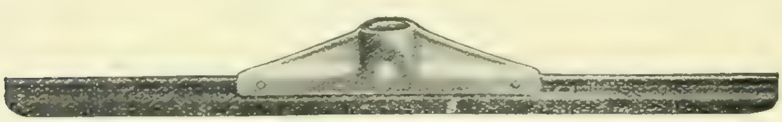
198. **Tungsten.**—A Liverpool firm desires to correspond with Canadian exporters of "tungsten."

O-B Extruded Trolley Ears.

The Ohio Brass Company, of Mansfield, Ohio, have just placed on the market what they name the Extruded Trolley Ear, and which they claim will greatly reduce the expense of trolley ear maintenance. This new ear, shown in the accompanying illustration, is composed of two pieces, a runner piece and a boss. The boss is of malleable iron, galvanized, and is pressed upon the runner piece and then securely rivetted in place.

As the name would imply, the runner piece or portion which grips the trolley wire is made of extruded metal. A billet of pure cast bronze is placed in a furnace and heated to a bright red heat, after which it is taken out and immediately inserted in a very thick walled, laminated steel drum having a tungsten steel die clamped against the opposite end of this cylindrical drum. This die has an opening in it exactly the shape of the section of extruded metal which it is desired to produce and both the steel drum and tungsten steel die are specially designed to withstand enormous pressures at high temperatures. A hydraulic ram is brought to bear upon this red hot billet of cast bronze forcing it out through the die under several tons of pressure. The metal, as it emerges from the die, is cooled rapidly by a very strong blast of cold air. Metal so produced is uniform in dimensions and in structure, has a tensile strength of 70,000 pounds per sq. inch, an elastic limit of about 50,000 pounds and an elongation of .33 per cent. On account of these properties the metal is peculiarly adapted for use as a trolly wire support.

Examinations of extruded ears that have been in use for several months under a two-minute car service showed that the lips of these ears were tightly closed around the wire so that it was impossible to detect the actual joint between the lips and the trolley wire; also, the ends of the ears were found to grip the wire just as well as the central portion, instead of curling up as is often the case in cast



ears. The claim is also made that it has been proven conclusively by these tests that this ear has an exceptionally long life and that it causes less wear to trolley wheels than other supports.

Represent Prosperous Firm.

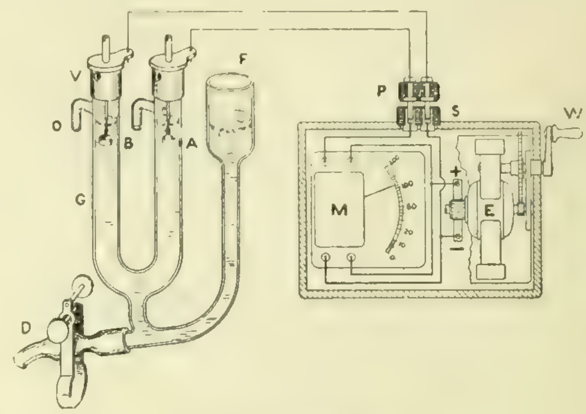
Vandeleur & Nichols, Canadian representatives Bruce, Peebles & Co., Edinborough, Scotland, announce that their principals have been awarded a contract, by the Calcutta Electric Supply Company, of India, to supply sixteen motor converters of 475 kw. capacity each. The value of the contract is $125,000.

Branch Office in Montreal.

Messrs. Kilmer, Pullen & Burnham, Limited, of Toronto, sole dealers in Canada for the General Electric Manufacturing Company of Sweden, have opened a branch office in Montreal at 11 St. Sacrament street. Messrs. Spencer and Campbell have charge of the management of this office.

An Electric Water Tester.

The detection and estimation of impurities dissolved in water has hitherto been carried out by chemical tests of more of less complexity and water testing suggests at once a skilled chemist and all the paraphernalia of a chemical laboratory. A new apparatus known as the Dionic Water Tester substitutes a simple electrical measurement of conductivity for the chemical reactions hitherto used for the purpose. The working principle of the apparatus is based upon the fact established by Kohlrausch that the conductivity of pure water containing any electrolytic substance in solution is due almost entirely to the dissolved substance and only to a negligible extent to the water itself. Kohlrausch established the law that, provided a solution is very



Dionic Water Tester

dilute, the conductivity is proportional to the percentage amount of the substance dissolved in the water. The Dionic Tester is able, by measuring conductivity, to measure with accuracy the percentage amount of any electrolytic substance dissolved in water. It does not discriminate between one kind of substance and another; analysis alone can do that. But in most instances in which water testing is carried out for engineering and kindred purposes, the substance present in the water is well known, having been ascertained once for all by analysis, or being inherent in the source of supply. Such tests are not made for purposes of analysis, but to find out how much of a known substance is present in the water.

The complete apparatus is shown in the figure where G is a bent glass tube to contain the water under test, and A and B are the electrodes for passing the electric curent through the water. The electrodes are connected by wires to a direct-reading conductivity meter M, and a continuous-current hand-driven dynamo E, so that by turning the handle W of the dynamo, a current traverses the meter and the water in the conductivity tube G. The pointer of the meter is deflected, and comes to rest at some point upon the scale which directly indicates the conductivity of the water in the tube. The test is completed as soon as the pointer has come to rest, that is to say, in two or three seconds.

The Canadian National Carbon Company.

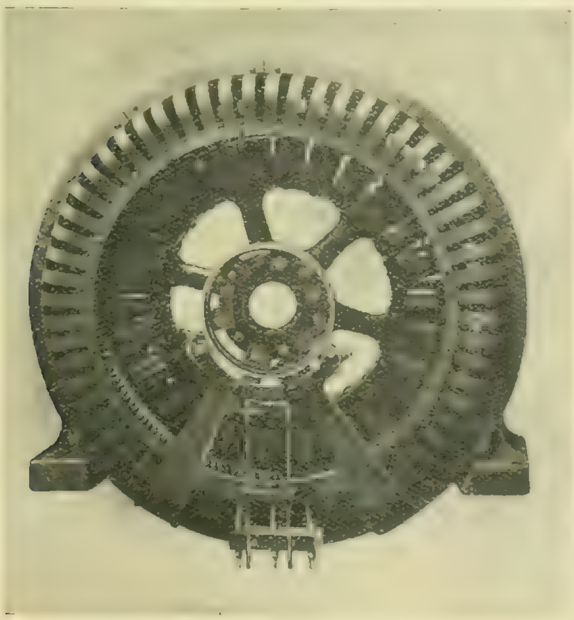
Last October Canada added to its rapidly growing list of industries a new battery plant in Toronto. This plant is known as the Canadian National Carbon Company, Limited, and is a branch of the National Carbon Company, whose headquarters and general offices are located in Cleveland, Ohio. The Toronto branch is located at 99 Paton Road and extends along the main branch of the Grand Trunk. A particularly interesting feature of this plant is the fact that it is "all Canadian." All the machinery and equipment were either bought or made in Canada, with the exception of a few special machines brought from Cleveland. Furthermore, all of the men on the pay roll are Canadians except two experts, who teach the art of battery making. The

Toronto Factory National Carbon Company, 99 Paton Road

machinery is of the most modern type and the factory throughout is equipped with safety devices, and special attention has been given to sanitary conditions and a consideration for the comfort of the employees.

A. C. Engine Type Generator.

A line of low speed, 60 cycle, engine type alternators, embodying a number of new features of design, has been recently placed on the market by the Westinghouse Electric & Manufacturing Company. The line covers capacities from 50 to 1,100 k.v.a., 2-phase or 3-phase, and standard voltages of 240, 480, 600, 1200 and 2400 volts. A striking characteristic of the entire line, as shown by the machine



already in operation, is the ability of the generators to successfully carry commercial loads of low power factor.

The stator frames are of such design as to give great rigidity and plenty of freedom for the end connections of the armature winding. At the same time the construction is economical of material and affords excellent ventilation. The frame consists of a one-piece casting, except in sizes of such diameter that a split frame is a necessity for shipping reasons. In such cases the halves are bolted firmly together, making practically a solid frame. The frames of the smaller sizes are provided with slide rails on which the frame can be shifted to expose the rotor.

The armature core is built up of laminations of japanned steel of good magnetic characteristics. The laminations are dove-tailed in recesses in the frame. They are assembled under pressure and securely held by finger plates and end plates. Generous ventilating ducts are provided in the core to maintain uniform low temperature. The teeth are firmly supported at each end of the core by finger plates.

Ample factor of safety is allowed throughout the mechanical design and the electrical design is such that overloads and low power factors do not interfere with satisfactory service.

Ferranti, Limited, Extending.

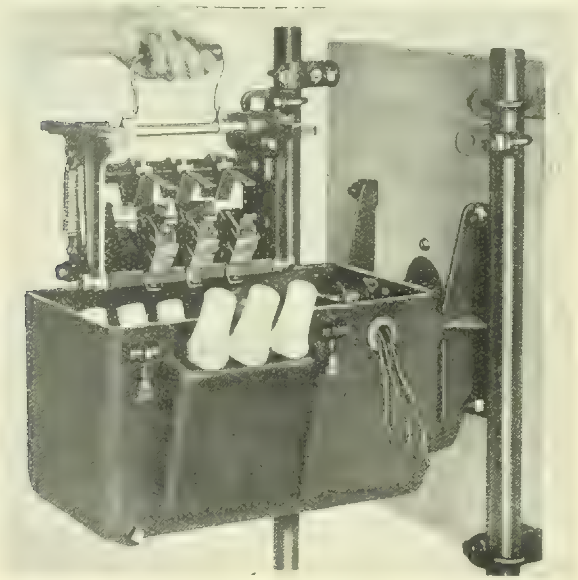
The Canadian branch of Ferranti, Limited, electrical engineers, of Manchester, Eng., have now added to their premises at West Toronto a complete switch gear and estimating department, of which Mr. Nils W. Lofvengen, E.E., recently arrived from headquarters in Manchester, will take charge. The meter department also has recently been considerably enlarged to enable this firm to carry sufficient stock to meet the demands now being made for the Ferranti Meter, which would seem to indicate the popularity of this meter with central station men. We understand that in view of the past year's business and the encouraging outlook for the future that a proposition for the erection in Toronto of a factory fully equipped for the manufacture of meters and complete switchgear appliances is now being seriously considered by the heads of the firm, of which Mr. G. C. Royce, of West Toronto, is the Canadian representative.

Mr. M. K. Pike and Mr. H. W. Billings, representatives of the Northern Electric Company, of Winnipeg and Calgary, respectively, have been visiting the head office and the works of the company at Montreal.

Veritys, Limited, announce that as the result of their recent trip to Canada they have decided to make some small changes required to bring their goods into line with Canadian standards and have appointed the Central Electric and School Supply Co., 35 Adelaide street west, Toronto, their Ontario agents. This is one of the largest English manufacturing houses dealing in motors, dynamos, d.c. and a.c. fans, controller gears, arc lamps, conduit and wires, fixtures, metal filament lamps, heating and cooking apparatus, etc.

New Type of Oil Swithch.

The Allis-Chalmers Company has recently brought out a new type of oil switch designed for either switchboard or wall mounting, for pressures of 3300 volts and under, and in capacities up to and including 500 amp., furnished with or without automatic tripping features, as may be desired. These switches are of the vertical up-break type, a construction which the company has found very desirable because of the fact that maximum depth of oil is secured at the point of rupture of the circuit. The company claims many advantages for this switch over the usual type. Among others the switch unit can be removed and taken to an adjacent bench where a thorough inspection and all



Interior, type A non-automatic Allis-Chalmers Oil Switch, 200 amperes

necessary adjustments can be made with good light. Also the switch units of any one size are absolutely interchangeable so that an extra switch unit can be placed in the case while one which has been in operation is removed, if this procedure is desirable.

High Voltage Street Series Lighting Units.

The Benjamin Electric Manufacturing Company are placing on the market a number of new street series lighting fixtures. Cuts of representative fixtures, and the socket used are shown herewith.

The socket itself consists of essentially three porcelain parts: (1) A central or body portion with integrally formed knobs; (2) a lower removable bushing carrying the threaded socket shell and film cutout spring; (3) a surmounting petticoat insulator.

The base portion has a center bore in which are located the center spring and short-circuiting contact, together with means for co-operating with the lower or removable portion. Beneath the knob are grooves forming protected and insulated passages for the wires. On the upper side of the base there is an iron fitting supported by four screws deeply counter-sunk in the porcelain. Between the two is a rubber disc. The lower part may be inserted by merely pushing it forward and turning to the right, or removed by pulling it outward and turning to the left. The petticoat insulator is held in position by a lock nut and washers passing over the upper end of the fitting, thus making a watertight joint.

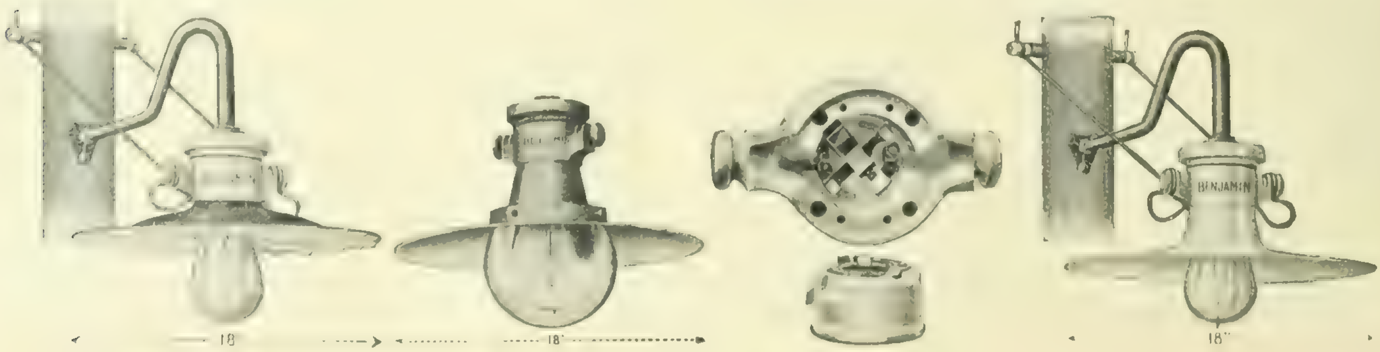
For the purpose of insulation provision is made for span wire suspension, for gooseneck or other ¾-in. pipe connection by means of special fitting. The reflectors used are thoroughly insulated from the support. They are attached by four screws passing through holes cemented in the back.

The Friendly Testing Bridge.

The Friendly Testing Bridge is designed and made for the purpose of testing and locating faults on telegraph and telephone lines, electrical conductors, and in electrical apparatus. The bridge is available for the measurement of resistance as a Wheatstone Bridge, faults may be located by the Varley or Murray loop methods, or by a new method known as the Friendly Loop, the theory of which is considered below.

The bridge is compact, the construction is solid and substantial, the workmanship is of the highest grade, the resistances are of manganin wound on metal spools and adjusted to an accuracy of 1-10 of one per cent. The metal parts are mounted on a heavy hard rubber top of best quality, the arrangement is convenient for rapid manipulation. Great care has been taken to secure permanency and minimum resistance in the various contacts. A new and ingenious arrangement of the ratio coils has been adopted, permitting unusual ratios, and a new construction for the decade dials maintains low resistance contacts and smoothness of motion with very small wear. This contruction allows a continuous motion of rotation in either direction. There are ten units in each decade, an arrangement which makes for quicker manipulation than the usual nine unit decades. The galvanometer is of the moving coil type and is of high sensibility. Provision has been made so that any other galvanometer can be connected, if desired. The cover may be removed entirely and is provided with dust tight openings, so that the box can be closed and locked without disconnecting the wires leading in.

The diagram shows the connections which allow the application of the Friendly Loop Test. The faulty wire is connected to a good wire at the distant end as in the Varley Loop, and as in the latter test, this return wire may be of unknown length and resistance. The loop under test is connected to the "X" posts. In order to have the faulty wire adjacent to the rheostat arms it may be necessary to change the reversing switch which changes the relation of



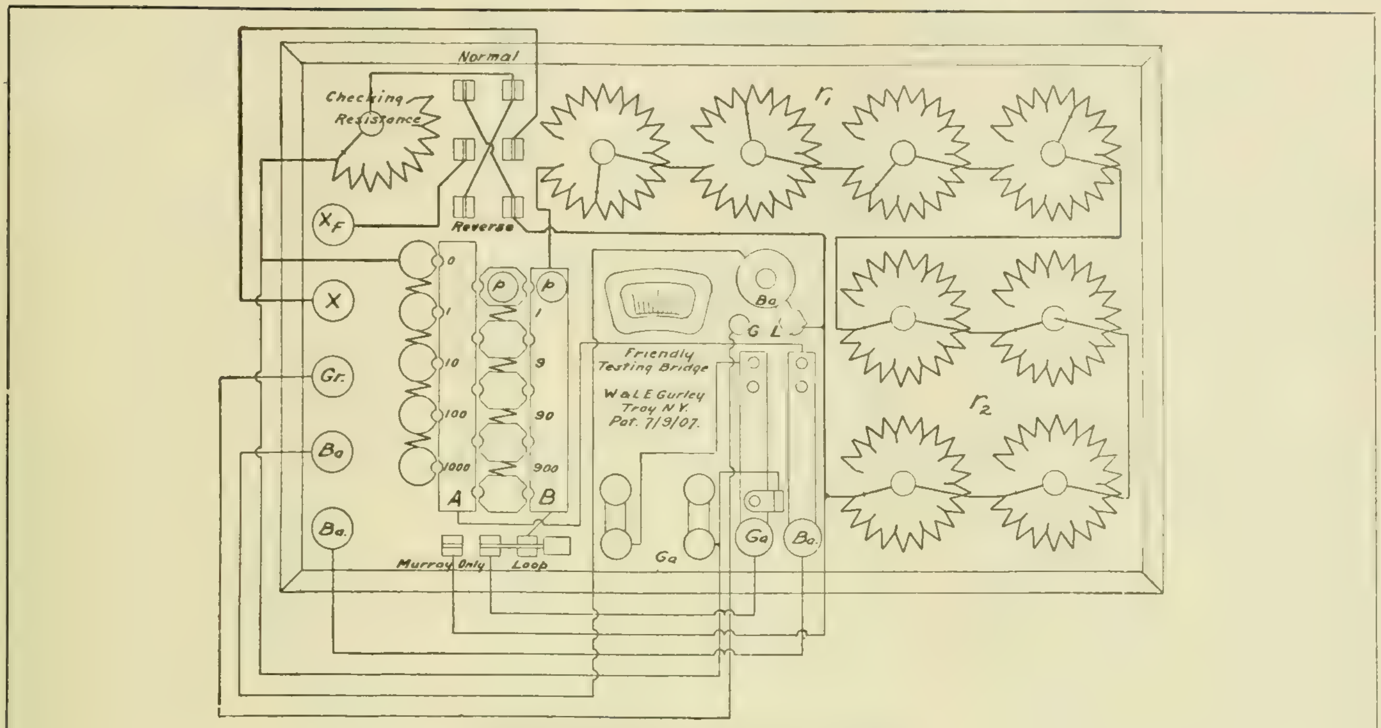


Diagram of top of "Friendly" Bridge.

the "X" binding posts. In the normal position the "X" post denoted "F" is adjacent to the ratio arms. The A arm is set to a value of 1, 10, or 100 and the B arm to a value of 9, 90, or 900, making the sum of A and B equal to 10, 100, or 1000. Consider that the value of A is 10 and of B 90, making the ratio $A : A + B$ equal to $1 : 10$. All rheostat dials are now set at zero, the battery switch is set to "ground," the galvanometer switch is set to "loop" and a balance of the galvanometer is obtained by including resistance in either one of the rheostats (both are similar and are in series). The battery switch is now set to the "loop" position, causing an unbalanced condition of the bridge and circuits. A new balance is obtained by adjusting the second rheostat (the first rheostat remaining as previously set). The value of the resistance in the second rheostat, after pointing off one decimal place, is the resistance in ohms of the fault in the faulty wire. In general, the number of decimal places to be pointed off is equal to the difference in the number of ciphers in the A arm, if any, and the number in the sum of the A and B arms.

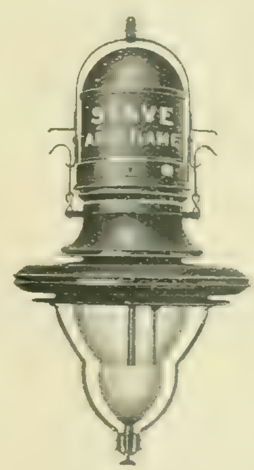
A New Long Burning Flame Arc Lamp

The Engineering Equipment & Supply Company, of Montreal, are introducing on the Canadian market a new type of flame lamp which is a distinct improvement over all existing forms. This lamp, which is being manufactured by the Stave Electrical Company, of New York, is particularly adapted for any kind of lighting requiring an intense white, pearl white, or yellow light, free from flickering. The lamps are made for a.c. and d.c. and have electrode life per trim of 100, 150, and 200 hours.

The principle adopted in this lamp, see figure, to secure long burning periods, is the total enclosure of the arc. The upper portion of the globe is clear to allow of the light being distributed; the lower portion is opaque and serves as a receptacle for the ashes or deposits from the arc. The shape of the globe is such that the lower portion is cooler than the upper, consequently all heavy ash sinks to the bottom. Above the arc a deposit chamber is arranged, which, owing to its large radiating surface, causes all lighter gases to condense inside it; a constant circulation is thus set up, and the ash deposit got rid of, and there is absolutely no loss of light through deposits on the globe.

The mechanism, following the best European practice, is housed in the top of the lamp, so as to be entirely removed from any possibility of injury, due to the gases given off by the arc.

The maximum light is distributed at an angle of 20 degrees under the horizontal, so that the lamp need not be hung so high as the ordinary flame arc with converging



carbons, thus reducing cost of installation where used for street lighting.

For street lighting this lamp can be used with the existing installations of regulating apparatus, taking the place of enclosed and magnetite arcs, without the necessity of elaborate recifier and regulating transformer installation, and their necessary complications.

Mr. A. Pritzker, manager of the National Electrical Heating Company, of Galt, who has just returned from a five weeks' trip east, states that he has brought with him a large amount of business and that he is more than satisfied with the remarks he heard about the National Electric devices.

Current News and Notes

Berlin, Ont.

A test is being made with 60 c.p. tungsten lamps on Queen street north. The arcs are considered unsatisfactory on account of the dense foliage.

An agreement has been signed with the Keystone Driller Company for a deep well pump and an order given for one Bergmann 15 h.p. induction motor for delivery April 1st.

The Water and Light Commissioners and a committee of the council visited Toronto, Hamilton, Buffalo and Rochester, N.Y., during February, to inspect various street lighting systems for the purpose of adopting the best.

Superintendent Philip has been instructed to secure a new transformer to be installed at the new ice plant on Courtland avenue. The Commission decided to purchase a supply of tungsten lamps for the convenience of consumers which will be sold at cost price. It will be some time, however, before the lamps can be secured owing to the great demand that is being made on the manufacturers. Supt. Philip was also instructed to prepare an estimate of the cost of the extensions to be made to the electrical system this year and submit it at the next meeting.

Calgary, Alta.

Tenders were called by City Commissioner until February 20th for the supply of ornamental lamp posts. A. E. Graves, City Commissioner.

The council has decided to submit a by-law for $50,000 for the purchase of the power site on the Elbow river. Engineer Child's estimate of the flow is 200 feet per second.

Tenders addressed to city commissioners will be received until March 22nd for supply of the following: one 1,500 turbo generator set, with condenser, etc., three 1,000 k.v.a. single phase transformer, 12,000 to 2,300 volts, with switching gear, etc.; one 100 kw. exciter. W. D. Spence, city clerk.

City Electrician O'Brien, in his annual report to the commissioners, recommends the use of heavier copper, and especially four heavy feeder wires to different parts of the city. He recommends the installation of 125 magnetite lamps for the central part of the city; the present arc lamps are to be removed to outer portions. A new motor truck is also recommended for the service gang, the present motor that this gang uses being recommended for use of the city wiring inspector and the city engineer.

This city has just granted a franchise to a company to bring in natural gas from Bow Island, a distance of 150 miles, and sell it in the city at a rate of 20 cents per thousand feet for power and 35 cents for lighting purposes.

The Calgary Power and Transmission Company are making surveys of the banks around Lake Minnewanka, with a view to building up a few of the outlets and creating a storage reservoir. It is believed the water of the lake can be raised eight feet in this way which, with a 12 square mile area, should tide the company over the worst dry season.

A by-law to expend $380,000 on electric light extensions will be submitted to the people about the first week in March.

Chilliwack, B.C.

A plan outlined by Ald. Waddington for the improvement and extension of the city lighting scheme includes the installation of about a dozen arc lights in the business portion of the city, and a large increase in the number of incandescent lights throughout the residential districts.

Dartmouth, N.S.

The Electric Light System is owned by the town. Profits for the year 1910 amounted to $3,596. The total receipts for the year were $10,816.

Dunnville, Ont.

The directors of the Dunnville, Wellandport and Beamsville electric railway are making preparations to resume active operations on construction as soon as possible. They have set up a mill and have a force of men at work getting out ties. It is said that the completion of the road to St. Anns this year is now assured.

Dundas, Ont.

The council have passed the by-law authorizing contract with the hydro-electric company and raising $12,000 by debentures for erecting a portion of the necessary distribution plant.

The town council has appointed Mr. H. Stievenpipen superintendent of the proposed Hydro-Electric installations.

Edmonton, Alta.

The Edmonton Heating & Power Company have submitted a proposition to the city offering to sell 10,000 h.p. at $27 or at a cheaper rate under special conditions.

Engineer Latornell and superintendents McNaughton and Ormsby visited various cities in Eastern Canada and the United States during the month of February to gather, at first hand, information which will enable them to decide on the best system of power development to be installed in this city.

It is said to be the intention of the Edmonton Interurban Railway Company to commence building operations between here and St. Albert in the early spring. Power will be supplied from the latter town where a plant is already installed. The complete programme of the company includes the construction of some 100 miles of suburban railway lines radiating out from Edmonton and serving every large town and settlement within a radius of 20 miles.

It is stated that a firm having headquarters at the Pacific coast will apply for franchise to supply natural gas from a source some 25 miles from the city.

Application has been made to the Dominion Government by this city for power rights at the Grand Rapids on the Athabasca River. Plans filed with the application show a maximum power, if all the dams are built, of 60,000 horsepower.

Elstow, Sask.

Tenders were called until February 18th for construction of about 75 miles of telephone line, etc. H. Young, sec.-treasurer.

Fort William, Ont.

Tenders addressed to the Chairman of Utilities Committee, will be received until March 2nd for supply of "Line Material." A. L. Farquharson, manager.

The new Smith heating system, which has been installed in one of the street railway cars, as an experiment, has proved to be quite a success. It is possible that all the cars will be installed with this heating system.

Manager M. O. Robinson, of the Port Arthur & Fort William Street Railway system, recommends the installation of an additional 500 kw. generator set at the Fort William end of the line. It is also proposed to replace some of the present rails with heavier weights.

Fredericton, N.B.

John E. Stewart, Andover, is promoting a company which will seek legislation at the approaching session of the legislature for incorporation, with power to erect and maintain a dam across the St. John River at or near the Hawkshaw bridge, 40 miles above Fredericton, to develop electricity for light, heat and power purposes, and to transmit the same. The company, known as the St. John River Electric Power Company, will seek rights to purchase, expropriate or otherwise acquire rights, easements, franchises and privileges necessary for the operation of the company.

Goderich, Ont.

The Ontario West Shore Railway Co., which is building an electric line from Goderich to Kincardine, is seeking from the Ontario legislature extension of its charter to permit it to build from Goderich through Clinton, Seaforth, Mitchell, etc., to Stratford, also to increase the bond issue.

Guelph, Ont.

Tenders are being received by the Street Railway Commission for construction of new branch to be built in St. Patrick's Ward.

The Radial Railway Commissioners have authorized their manager to purchase two large pay-as-you-enter coaches and a 30-ton freight locomotive with four-motor equipment.

The Guelph Radial Railway Company is asking extensions of its charters for the various proposed extensions to Puslinch Lake, Hespeler, Elora, Fergus, and other points.

Hamilton, Ont.

Applications are being received until March 15th from electrical engineers for preparing estimates of cost, etc., for a municipal electric power and light system. S. H. Kent, city clerk.

The controllers on February 7 decided to advertise for an independent electrical expert to make a complete report for Hamilton on the establishment of a house lighting, street lighting and power distribution plant to be operated by power purchased from the Hydro-Electric Commission, and also to value the local plant of the Cataract Power Company, which the city may purchase.

The estimated expenditures for the current year include the sum of $43,000 for street lighting.

Kingston, Ont.

The light, heat and power department of the corporation of Kingston will spend $13,000 in the installation of about 150 street lamps. Different makers are now giving demonstrations as to the efficiency of their particular type of lamp.

London, Ont.

At the annual meeting of the London Street Railway directors it was decided to build an up-to-date steam power plant, and abandon the proposals for the use of hydro-electric power from Niagara.

It is expected that the Canadian Pacific Railway Company, who are making extensions and installing new machinery in the east end yards here, will be a good customer for Niagara power. Already a contract for some 100 h.p. has been arranged.

In addition to carrying on its train despatching by telephone the C. P. R. trains between Toronto and London will be supplied with a collapsible pole, with which to connect the telephone wire, and with a full telephone equipment. Should a train, from whatever cause, require to communicate with a station, the ways and means will be at hand. This innovation is likely to be of great service.

The water commissioners will furnish electric light to those living in the immediate vicinity of the city at a rate of 7 cents a kilowatt, with 10 per cent. reduction, making it 6.3 cents a kilowatt net.

Superintendent Glaubitz reports that the work at Springbank is proceeding rapidly, and he hopes to have the new machinery installed by the first week in March.

Monteral, Que.

Mr. Z. A. Lash has been elected a director of the Bell Telephone Company of Canada. Receipts for the year were $5,510,685, as against $4,949,197 in 1909, while the net revenue was $1,547,125, against $1,468,889 in 1909. Interesting statistics were submitted in the annual statement as follows: During the year 19,175 subscribers have been added, the total number of instruments now earning rental being 133,910. From the balance of revenue account, amounting to $672,202.26, $50,000 has been charged to depreciation of real estate, $25,000 off patent account, $97,597.12 has been carried to fire insurance reserve, $53,311.93 to accident reserve, $200,000 to depreciatoin reserve, and $25,000 added to the contingent account, leaving a balance of revenue account to be carried to 1911 of $121,393.89. The board of directors was elected as follows: C. F. Sise, Hon. Robert Mackay, Theo. N. Vail, Robert Archer, Wm. R. Driver, Hugh Patton, Charles Cassills, H. B. Thayer, L. B. McFarlane, Z. A. Lash, K.C.

Plans will be ready by the end of March for the new power house for the Saraguay Company. They will include the specifications for two steam turbines of 4,500 maximum h.p. capacity each, boilers and general equipment. Mr. Charles Brandeis, civil engineer, is in charge.

At a directors' meeting of the Montreal Light, Heat and Power Company and the annual meeting of the Shawinigan Power Company a deal was arranged by which the latter supplies another 40,000 horsepower, making the total 63,000 horsepower. The agreement is for fifty years.

The Railway Commission refused the application of the Montreal Terminal and the Montreal Park and Island Railways Company, two electric lines operating in the rural districts surrounding Montreal, for the right to adopt a standard rate of three cents per mile and a minimum fare of five cents. Chairman Mabee said that the managers of the railway had acknowledged that they could operate the roads on a standard tariff of two and a half cents per mile, and he fixed the rate at that price.

Moncton, N.B.

Mr. O. P. Boggs, manager of the Moncton Tramways Electricity & Gas Company, and Mr. E. A. Mitchell, consulting engineer, have returned from a trip to Montreal, Pittsburg, Buffalo and other points, where they were looking up material for the tramway and natural gas installation.

Moose Jaw, Sask.

The Moose Jaw Electric Railway Co. is applying for a charter at Ottawa which, in addition to street railway rights, will allow the company to build and operate suburban lines; to sell light and power to the communities through which the company's lines may pass; to construct and conduct hotels, restaurants and amusement parks, and to own and operate steam or other vessels in connection with the conveying of passengers and freight. The company is composed chiefly of Ottawa men. Mr. A. Hector Dion is resident engineer during construction.

New Hamburg, Ont.

Niagara power was turned on here on February 3 and the town is now brilliantly lighted. The reconstruction of the plant was under the direction of Mr. E. B. Merrill, consulting engineer, Toronto.

New Westminster, B.C.

In future all employees of the British Columbia Electric Railway Company must pass a written examination, on the rules of the road, such as are in vogue on all steam railways. The examinations are already in force. It is expected that by the end of the month 120 men employed in the suburban lines of the railway will have written on these examinations.

Ottawa, Ont.

The Morrisburg & Ottawa Electric Railway are seeking a franchise to build a railway along Main street to connect with the Ottawa Street Railway. C. M. Willard, Morewood, Ont., president.

The Ottawa Light, Heat & Power Company will meet the municipality in its reduction of rates. It is found that the new method of charging by the city does not mean a reduction in every case and it is believed the company will even give its customers their choice of the old or new rate.

A bill to extend the charter of the Mather Bridge and Power Company, which came before the Railway Committee of the Commons was passed. The company was incorporated in 1896 and proposed to combine the building of a bridge across the Niagara river with a power development scheme. Although a considerable sum of money has been expended on the Canadian side, progress has been delayed because of the refusal of the United States government to allow the bridge to be constructed until a canal on their side of the river has been completed. This is expected to be done not later than 1913, and the promoters then believe that the United States would give its consent to the construction of the bridge.

During the latter part of January the water of the Ottawa river was lower than the oldest inhabitant remembered having seen it at that time of the year. Great inconvenience was caused the various operating companies, including the J. R. Booth Lumber Company, the E. B. Eddy Company, the Ottawa Electric Company, the Hull & Ottawa Electric Company.

The proposed line of the C. N. R. between Ottawa and Port Arthur will pass close to Chats Falls. It is reasonable to expect that this water power will be developed and inducements offered to large manufacturing firms to locate in that neighborhood.

Mayor Hopewell has the following motion prepared: "That the commission recommend to council that as the city will require a further supply of power the hydro-electric commission be requested to enquire into and report upon the best available source of supply."

Hon. L. P. Brodeur, Minister of Marine, has introduced a bill to amend the Telegraphs Act, the object of which is to provide that all passenger steamers registered in Canada, which carry more than 50 passengers to a point 200 miles or more from the point of starting, must be equipped with wireless telegraphy.

Mr. James E. Hutcheson, superintendent of the Ottawa Street Railway system, states that P. A. Y. E. coaches will be used entirely in this city in the course of a couple of years. At the present time twenty of these are under construction in the shops of the Ottawa Car Company and are to be ready for delivery in April of this year.

In December, 1908, a lease of certain water powers at Carillon and Pointe Fortune was granted to Mr. C. Ross, of the C. Ross Company, Ottawa. Mr. Ross is now said to be actively engaged with the formation of a sufficiently strong financial company to undertake early development.

Owen Sound, Ont.

At a recent meeting of council the electric light committee obtained permission to make arrangements for buying another engine and dynamo.

Parry Sound, Ont.

This town's charges for lighting are 4c. per kilowatt hour, plus 15 cents meter rental.

Penticton, B.C.

This municipality has under consideration the establishment of a hydro-electric plant and lighting system to cost about $70,000. Contract will probably be let in two or three months. F. H. Latimer, consulting engineer.

Point Grey, B.C.

As a result of complaints made by the residents of Point Grey, who allege that in many houses in this district electrical wiring has proved defective and is a source of considerable danger, Councillor Richardson has given notice of a by-law to provide for the appointment of an inspector who will have charge of all

work of this nature carried out in the municipality.

Portage la Prairie.

Ald.Sweet, chairman of the special power committee of the council, appointed for the purpose of conferring with the Central Electric and Gas Company, with a view to the purchase of the plant by the city, has received a letter from the shareholders of the company containing the figures of the cost and putting a selling price valuation on the plant of the company.

Mayor Garland has expressed himself in favor of a municipally owned electric plant, and negotiations will probably be opened with the Central Electric Company for the purchase of their private system.

Prince Albert, Sask.

Contracts will probably be let shortly for a 600 k.w. direct-connected unit (engine or turbine) at the municipal electric light plant; also preliminary work in connection with a 10,000 h.p. electric plant.

The deputation which went to Ottawa reports that Prince Albert will be given the La Colle Falls power site on much the same terms as Winnipeg secured the Point du Bois site, a certain amount of development of power being required. In regard to the proposal that the government in making out its scheme to make the Saskatoon river navigable should co-operate with the city in its power scheme work at La Colle Falls, the deputation said that the suggestion has been favorably received by the ministers at Ottawa. The extent of the co-operation cannot be determined until the engineers on the river survey have made their complete reports to Ottawa.

Quebec, Que.

Notice of an important amendment to the law of 1909 on the Public Utilities Commission has been given by Premier Gouin. It is understood the new legislation will clear up certain points as to the powers of the commission.

The Private Bills committee of the Legislative Assembly has passed the Saraguay Electric and Water Company bill authorizing the directorate to issue part of their capital stock as preferred stock and to ratify the company's lighting contracts with Tetreauville, Pointe aux Trembles, Sault au Recollet and Montreal East.

A bill has been introduced in the Quebec legislature providing for the amalgamation of the Montreal Street Railway and its three suburban lines. The Montreal Street Railway Company has been negotiating with the city for an extension of its franchise, but up to the present very little progress has been made. To avoid the possibility of failure to reach an agreement the bill provides that if at the end of a limited time the city and the company have been unable to come to an agreement, the entire matter of a new franchise for the city and its suburbs is to be placed in the hands of the Quebec Public Utilities Commission with power to make a contract with the company on the city's behalf. The decision of the commission on all matters pertaining to the contract is to be final. In bringing about the amalgamation of the four companies it is provided in the bill that the Public Utilities Commission shall have the right to fix the terms so as to prevent the watering of stock. Two of the suburban companies are under Federal charters, and it is provided that these shall be given up and the companies placed under control of the commission.

The proposed merger would include the following lines: Montreal Street Railway, 144.25 miles; Montreal Park and Island Railway, 49.64 miles; Montreal Terminal Railway 30.27 miles; Public Service Corporation, 6.92 miles; total, 230.28 miles.

Regina, Sask.

The city of Regina will seek special legislation to be allowed to exceed its present legal borrowing powers to the extent of the sum of money required to build a municipal gas plant.

A by-law providing for additions to the electric lighting plant at a cost of $100,000 will be submitted shortly. This provides for the installation of electric lighting additions, the street railway generating unit and equipment.

The order for supply of two double truck cars, complete with quadruple motor equipment and air brake, and also four single truck cars with double motor equipment (the cars to be built by the Brush Electrical Engineering Co., Ltd., London, Eng.), was placed with the Canada Ford Company, 485 James street, Montreal.

The contract for supply of rails, etc., for municipal railway here went to U. S. Steel Products Co., of which the details are as follows: 560 gross tons 80 lb. Lorain sec. 335 rails at $58.84; 247 gross tons A. S. C. E. 60 lb. rails at $50.50 620 pair Lorain splice bias at $3.10 per cwt.; 460 pair A. S. C. E. splice bias at $2.45 per cwt.; 5560 Lex. head bolts at $4.50 per cwt.; 6,000 rail spikes at $2.60 per cwt.; 2200 rail bonds M.P.3 4/0 13 inch c-c at $46.25 per cwt.; 100 cross bonds C. P. X. 4/0 60 inch c-c at $91.00 per cwt.; 20 cross bonds C. P. X. 4/0 66 inch at $98.00 per cwt. L. A. Thornton, city engineer.

The total estimated cost of the work during the present year is $213,000, and for 1911 and 1912, $402,000. The estimates of the commissioners for the present year provide as follows:

Five and one-half miles track	$135,000
Six cars	38,500
Snow sweeper	4,500
Power unit	20,000
Car barns	15,000
	$213,000

For 1912 provision is made for the addition of seven cars.

Renfrew, Ont.

Engineers of the Hydro-Electric Commission are here to visit the upper lakes of Bonnechere River, looking for sites for dams for storage purposes. The town is expending $150,000 for power development.

A report was received from the engineers re the building of reservation dams on the upper lakes of the Bonnechere to the effect that a 10-ft. dam on the outlet of Lake Clear could raise the water seven feet, thus giving additional power for 100 days during the low water period of the Bonnechere.

Saskatoon, Sask.

The by-law authorizing city council to borrow $100,000 for the construction of dam and development of the "Drop-off" power near Rock Forest, was carried. Messrs. Ross & Holgate, Montreal, are engineers in charge.

Additional machinery for municipal plant will be purchased. E. L. White, superintendent, has recommended improvements and extensions involving an expenditure of about $140,000.

Sherbrooke, Que.

Two of the new pay-as-you-enter coaches have arrived and been placed in operation.

St. John, N.B.

The contract for construction of Telephone Exchanges here was awarded to J. H. Dorley, St. John.

Wm. M. Northcott, purchasing agent, has been instructed by city council to shortly call for tenders for supply of 300 iron standards to be used in the extension of cluster lighting system.

At a special meeting of the board of works the application of the St. John Railway Company to extend their tracks out the Westmorland road was approved and a recommendation sent to the council.

Notice is given that at the next session of the legislature application will be made for the incorporation of a company to be called the St. Leonards Electric Company. The object of the company is to carry on a general lighting business in the parish of St. Leonards, Madawaska Co.

St. Thomas, Ont.

Power has been turned on for a short test and the formal opening will take place in the course of a few days.

Mr. L. B. Gillett, superintendent of the street railway system, has resigned. A qualified electrician to take charge of the engineering work will be employed and Ald. Trott will act as supervisor. A sum of money varying from $25,000 to $50,000 will be asked of the ratepayers to place the road in proper working order.

Toronto, Ont.

Controller Hocken's special committee on the tube railways is asking the council for an additional $1,000, part to be used in preparing rough plans and part in extensive advertising for tenders.

Hon. Adam Beck, chairman of the Ontario Hydro-Electric Commission, will introduce in the legislature a bill empowering municipalities to contract with the Hydro-Electric Commission for power for rural use. The cost of the supply is to be met by charges against the lands of the farmers and others who take the power for agricultural use.

Truro, N.S.

The Fort Garry union depot extension and train shed will be lighted by Westinghouse Nernst Lamps. About 500 glower units will be installed, varying in candle power from 105 to 745. The installation is in charge of Mr. A. E. Fleming, Toronto representative of the Nernst Lamp Company.

Notice of an order-in-council for the hearing of an appeal taken by the Chambers Electric Light Company against certain rulings of the board of public utilities for the regulating of charges for electric light and power has been received, and the parties thereto have been summoned to appear before the Lieutenant-Governor in Council on February 25th.

Vancouver, B.C.

Rumors are current throughout Point Grey to the effect that the tramline between Vancouver and Eburne will be double tracked this year owing to the great increase of freight and passenger traffic over the line. Requests for this improvement were presented to the B. C. Electric Railway Company by Eburne property owners last year anad the management of the road then promised to give the work serious consideration, it being recognized that a double track line would be demanded in the course of time.

It is expected that the first through train on the Burnaby extension of the B. C. Electric Railway between this city and New Westminster, known as the Fraser Valley and Southern Railway, will be run on March 1, the work of grading and laying rails having been proceeded with to the extent that the rails are now being laid through Burnaby.

Mr. C. F. Bollschweller, general superintendent of plant for the B. C. Telephone Company, stated that the new Pupin coil cable which will bridge the 16 mile water gap between here and Victoria would be laid during the present year. The building of a special boat for this work is now being considered by the company.

Welland, Ont.

The Niagara, St. Catharines & Toronto Electric Railway has inaugurated a passenger and freight service between Welland and Port Colborne. The track was completed some months ago, but the difficulty in crossing the railway delayed the opening.

The Welland Electrical Company has disposed of its power contracts, distribution lines, plant, etc., including lighting contracts in Port Robinson and Port Colborne, to the Ontario Power Company. Mr. L. R. McCleary becomes manager at Welland.

Windsor, Ont.

This city has just passed a by-law granting tax exemption to the Maloney Electric Company, of St. Louis. The Maloney Company manufactures electrical apparatus and will now build a branch factory in Windsor to cost in the neighborhood of $10,000.

Winnipeg, Man.

Mr. Justice Prendergast dismissed the application made to him by the Winnipeg Electric Railway Company to quash by-law No. 5907 of the city of Winnipeg to regulate the erection and maintenance of electric poles and wires. The two principal grounds for the application were:

First, that the by-law was ultra vires unreasonable, and oppressive. Secondly, that it was calculated to disturb and interfere with vested interests and conflict with chapter 36 of the Statutes of Manitoba, passed in 1880, being an act to incorporate the Manitoba Electric & Gas Light Company.

His lordship, in delivering judgment, stated that it is neither unreasonable nor oppressive for the city to discountenance the erection of poles and wires and dismissed the application with costs.

There is talk of the building of a municipal gas plant here. The rate is now $1.20, which the citizens consider too high. The present plant is owned and operated by the Winnipeg Street Railway Company.

Bills will be brought before the legislature of Manitoba at the coming session by which the Winnipeg Electric Railway will ask to have ratified and made statutory law the agreements made over ten years ago between that company and the old Manitoba Gas and the Northwest Electric Light companies.

The Winnipeg Electric Street Railway Company has agreed to meet the views of the city in regard to the laying of new lines to relieve the congestion of street car traffic in this city.

Colonel Ruttan, city engineer, is drawing plans for the proposed extension of the street car lines.

Tenders addressed to the Chairman, Board of Control, will be received until March 3rd for the manufacture of a motor car for use on standard guage railway track. Specifications, etc., at office of power engineers, Smith, Kerry & Chace. M. Peterson, secretary.

The Canadian General Electric Company have been awarded the contract for supplying the steam turbines and generators for the new plant of the Winnipeg Street Railway Company on Mill street. Three 3,000 kilowatt Curtis turbines will be installed. Total cost of equipment, $475,000. Pratt & Ross, 289 Garry street, architects and engineers.

Condensed Department

RATES.

Positions Vacant / Positions Vacant / Miscellaneous. — 2 cents a word and 25 cents for a heading, per insertion.

Tender advertisements, equipment for sale, etc., 15 cents per agate line (14 agate lines make one inch) per insertion.

Advertisers who wish to conceal their identity may do so by using an Electrical News box number without extra charge.

Forms close on the 18th of each month.

Miscellaneous

AGENTS WANTED in all parts of Canada to handle wood preserving for Poles, Cross-Arms, Railroad Ties and Construction Timber. For particulars write W. D. Ward, Tribune Building, New York. 2-4

Agents Wanted

Large American firm manufacturing a complete line of lineman's tools, and portable saw rigs for builders, contractors and lumber yards, wants Canadian representatives. For particulars, apply Box 223, Electrical News, Toronto, Ont. 3-3

Waterworks and Electrical Operator Wanted

Wanted Chief Operator for City Electrical and Waterworks Department, salary $125 for the right man. Address applications, including full references, to H. J. Glaubitz, General Superintendent, Ont. 3-4

For Sale

One S.K.C. Dynamo 2-phase, 60 k.w., 1,040 volts, 133 cycles, 1333 revolutions per minute, including switchboard and instruments, with exciter, Edison 1½ k.w., with spare armature. This outfit can be seen running at plant of the Alliston Electric Light Company, Alliston, Ont.; the reason for selling is that this machine is being replaced by a larger one. 3-6

To Electrical Engineers

Applications, accompanied by qualifications and testimonials, will be received by the City Clerk up to 5 o'clock p.m., **Wednesday, March 15th, 1911**, from electrical engineers, for the purpose of preparing estimates of the cost, plans and specifications for a municipal electric power and light system for the City of Hamilton.

S. H. KENT,
City Clerk.

Hamilton, February 16th, 1911. 3-3

Positions Vacant

Wanted

Electrical superintendent to take care of municipal distributing system and substation in a small city near Toronto. Applicant must have full knowledge of practical electric construction, indoors and outdoors, and must be able to make repairs, shall also be able to sell power and do other commercial work. State full particulars and salary required.

Address: Hydro-Electric Power Commission, Continental Life Building, Toronto. 3-3

Positions Wanted

Electrical Engineer

Englishman (24), technical graduate. Experience, three years drafting; 4 years installation and testing; 2 years central station. Box 229, Electrical News, Toronto, Ont. 3-3

Electrician, single, age 26, desires change. Present employed as foreman with firm of electrical engineers. Has had three years theoretical and seven years practical experience with electrical apparatus, laying out and installing lighting and power systems. Can handle men and understand estimating, etc. Box 227, Electrical News, Toronto. 3-3

Steam and electrical engineer, Scotsman, married, over 8 years chief engineer and manager public electrical supply, in Scotland, varied general engineering experience, first class references as to character and professional ability, arriving in Canada early in April, desires to hear of suitable opening, British Columbia preferred. Address Box 219, Electrical News, Toronto, Ont. 3-4

Young man completing third year in Electrical Engineering at McGill desires position for summer months with engineering firm engaged in hydro-electric installation preferably in British Columbia. Energetic worker and absolutely steady. Three years practical experience in small electric installations. Address, Box 213, Electrical News, Toronto, Ont. 3-4

Electrical News

Generation, Transmission and Application of Electricity

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Subscribers are requested to promptly notify the publishers of failure or delay in delivery of paper.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 20 Toronto, April, 1911 No. 4

Re High Tension Transmission Research

In the March issue of the Electrical News we took occasion to direct the attention of our readers to the benefits that would accrue to the electrical engineering profession if a series of properly conducted research experiments were performed on Ontario's 110,000 volt line now running from Niagara Falls to various points in southwestern Ontario. Since there can scarcely be any doubt of the value of such experiments if performed under the proper conditions, the present moment may be opportune to suggest a couple of reasons why the Ontario government should undertake such a research and make the results known with all reasonable haste.

1. This new 110,000 volt system belongs to the people of Ontario. It represents a type of expenditure being duplicated, more or less, in a large number of installations throughout the province. It is in the interests of the people of Ontario at large that these various installations should be according to the most approved practice. If the Commission's engineers have made any mistakes these should be published forthwith to prevent their duplication by other engineers. If the Commission's engineers have profited any by their experience that profit belongs by right to the people of Ontario. It is only one step further to say that if any more helpful information can be gained by further experiments on these lines this information belongs not to the commission or to the commission's engineers, but to the general public. Such information must raise the standard of electrical engineering in Ontario and would only be in keeping with the avowed policy of the government to legislate for the good of "the people."

2. The second reason that might be advanced in favor of such a research lies in the world-wide "prestige" the Ontario government might now gain as a leader in the development of high tension transmission practice. A good start has been made. There is no line in the world operating at a higher voltage than this one. With a research laboratory such as suggested, established and maintained by the government, Ontario's Hydro-Electric Commission may soon be known as the highest authority in the whole world on high tension work.

During the past month we have taken the trouble to call the attention of a number of prominent Canadian engineers to our recent editorial and have received a number of replies from men whose engineering experience and standing demand that their opinions be given every consideration. There has been an evident misunderstanding of the exact meaning of the editorial in one or two cases, and also, we believe, in one case at least, ground has been taken that is not easily tenable. We print the letters, however, in full. It is only fair to say that a number of opinions were expressed to the writer, entirely favorable to the project, by engineers who, either from present or past more or less intimate connections with the commission, feared any expression on their part may be misconstrued and so requested that their opinions be not made public at this time.

In the following, the writer's name is placed in each case before his letter.

Mr. P. W. Sothman.

"We have to say that the editorial as a whole is contradictory in its statements and that it is more or less misleading.

In the first portion you state that the results obtained by the researches carried on by Professor Ryan under laboratory conditions have been incorrect to an extent of 30 per cent. when compared with results since obtained under actual working conditions. Later on you state that such laboratory studies should again be taken up and that conditions here in Toronto are ideal for this kind of work; also you suggest that a trained university research scholar be placed in charge of such investigations.

Our transmission lines are not the result of a lucky guess nor of uncertain laboratory calculations. Every step in the design has been gone into in a painstaking way, because we knew that we were entering upon an hitherto more or less untrodden field, and nothing was left to chance. Our data has been gathered from all available sources and has been made use of to the fullest possible extent wherever applicable to our conditions.

In the matter of line losses, we placed ourselves on record some two years ago at the meeting of a prominent engineering society, to the effect that of the somewhat discordant results obtained by Professor Ryan on one hand, and by Mr. R. D. Mershon on the other, we considered Mr. Mershon's results as being nearer the actual truth. The results which we have obtained so far in the operation of our lines show that we have made no mistake in this connection.

As to the placing of a trained university research scholar on the work, we wish to point out that we have on our own staff of engineers, men qualified by actual operating experience who can carry on investigations down to the minutest detail, also that investigations of this nature are, and have been carried on since the very outset of the constructional period of our system. It would manifestly be unfair to our own men to call in outside help, and the experience of several power companies in the past has demonstrated that results when obtained under such conditions have been most unsatisfactory, in so far that the credit and recognition for the work has never gone to the proper parties.

We might state that we have now on order a number of

special instruments which are necessary for carrying on exact investigations to be conducted at various points on our transmission system, and that when results are obtained they most certainly shall be made available to the engineering profession through the proper channels."

Mr. W. G. Chace.

"I certainly am of the opinion that the opportunity now at hand for the carrying on of considerable number of electrical experiments should be taken advantage of with energy, under the care of an expert transmission engineer, assisted by a qualified laboratory man. The 110,000 volt problem cannot be considered to be solved as to mechanical or electrical features.

Trusting that your proposition meets with the favor of the Ontario Government and of their engineers."

Mr. W. L. Bird.

"The information obtained by research would be very valuable. Commercial companies and engineers have to base their plans on calculations and latest practice.

The A. I. E. E. transactions contain results of such researches by Thomas, Mershon and others. The value of such data obtained under practice such as with the Hydro-Electric 110,000 volt line would be invaluable, dealing as it does with a line pressure hitherto considered beyond commercial practice."

Prof. T. R. Rosebrugh.

"It appears to me to be highly creditable to the Hydro-Electric Power Commission that a laboratory has been planned in connection with the transmission.

Whether the present plans include investigations of the scope you mention I do not know, but there cannot be any doubt of the advantage of exact information along such lines to electrical engineers."

Mr. A. L. Mudge.

"A serious problem in connection with a long transmission line of extremely high voltage is the question of surges which are produced due to lightning, switching, short-circuits, grounds, etc. These surges sometimes produce voltages several times as great as the normal line voltage, resulting in damage to transformers and other equipment on the lines.

If tests can be made under practical working conditions on a line of the type of the Ontario Hydro-Electric Power Commission's line, a large amount of valuable information might be obtained with regard to surges of this kind, and if properly handled be the means of leading to the solution of some of the most serious problems that the high tension transmission engineer has to deal with at present.

This is only one of the lines of experiment that might be taken up in such a laboratory as you suggest, and I think that a lot of good work could be done in such a laboratory if it was properly organized and equipped."

Professor J. C. McLennan.

"I think the suggestion contained in your article on high voltage research a most timely one. It was certainly gratifying to find that the project of transmitting electricity at such a high tension as 110,000 volts has turned out a success, and it is most desirable that the conditions governing such transmission should be carefully studied, and publicity given to them.

I should be glad to place the Physical Laboratory at Toronto at the disposal of any student or other duly qualified person desiring to make a study of this problem of transmission at high tension. The great trouble, however, is to get hold of anyone with time to devote to the work. At the University of Toronto we are sadly in need of post-graduate scholarships for such a purpose, and I do wish some of our wealthier citizens could see their way clear to endow a number of these research scholarships. We have the men but they cannot afford to remain at the university longer than four years and so they are lost to us for research.

If we could offer annually some half dozen research scholarships of the value say, of $300 or $400 each per year, we should be in a splendid position for investigating just such problems as you mention.

It is too bad that through the lack of such scholarships our men leave us to earn a livelihood just when they are in the best position to undertake research work.

This means a great loss to the country, and of course limits the benefits which should accrue from the maintenance of a university. I hope the time will soon come when our people generally will realize that the great work of a university, after all, is in connection with research and investigation, and it is that phase of university work which directly promotes the industrial and commercial activities of a country."

Mr. Julian C. Smith.

"I hardly believe your position is well taken. My views are somewhat affected by the experience I have had both in research work and in the operation of a large power transmission system. Your remark about the results by Professor Ryan is not a fair statement of the case.

Anyone knowing Professor Ryan, or who has kept in touch with work which is being done on high voltage losses from wires would realize that Professor Ryan's paper before the American Institute, from which you quote, is an exceedingly important one, and that the results Professor Ryan has obtained cannot be dismissed with the phrase of being "merely laboratory results." It seems to me that it is quite evident to anyone that to obtain definite results the conditions under which results are to be obtained must also be definite.

It so happens that the conditions which affect losses from transmission lines due to the so-called corona effect, are from the very nature of things affected by the roughness of the wires, the barometric conditions, and other conditions of the atmosphere. When dealing with a long system, these conditions are to a large extent unknown, and only approximate results can be obtained, giving rough figures, and not what may be called "scientific results." Such definite results can only be obtained on short lines under conditions which can be accurately measured and using very delicate instruments and a high degree of skill. The fact that actual results so far obtained from transmission lines in operation, are not the same as the results obtained from laboratory experiments, only illustrates the fact above mentioned, that many conditions affect the results, and that therefore to obtain definite results one must approach to a considerable extent, conditions in a laboratory.

In 1907 and 1908, R. D. Mershon, of New York City, made an extensive set of experiments extending over about eighteen months at Niagara Falls under conditions closely approaching transmission line practice, using as far as possible the methods outlined above. Mr. Mershon's experiments covered work outdoors, using transmission line wires of short lengths, and to-day the results which he obtained are used as standards for this class of work.

Your statements do not seem to be in strict accordance with the facts. The operation of this line is neither due to uncertain laboratory calculations nor the lucky inspiration of a gifted engineer. The voltage used on this line is not the highest in the world.

There are two or three transmission lines in the United

States which have been in operation for some time, using voltage as high as 110,000 volts, and in one case at least, the voltage goes above this figure.

There are several other lines using voltages approximating three figures, and from which data is available. In the paper read by Prof. Ryan you will find a list of these transmission lines and information regarding corona losses.

To make experiments on such a system would necessarily mean the interruption of the service in whole or in part. To an operating engineer the value of the data to be acquired would not seem to justify the use of this expensive equipment for this purpose, particularly when it is evident that only one or two particular conditions can be obtained. For example, the spacing of the wires is fixed, the size of the wires is fixed, the frequency is fixed, and the voltage can only be varied over a comparatively small range. In other words, only one or two points on a curve can be obtained, and certainly not enough information to formulate a general law.

In a week's time with proper instruments, and without occasioning very much disturbance to the system some results could be obtained which could be used to verify the work done by other investigators, who have worked under better conditions than would be possible in such an investigation on the Hydro-Electric Commission's transmission line.

I believe that it would be extremely difficult to get any valuable information from the lines of the Hydro-Electric Commission because it seems to me that these corona losses will be a very negligible factor on the transmission lines of the Hydro-Electric Commission.

Your statement as to getting a trained university scholar and giving him equipment, corresponds exactly with what was done by Mr. Mershon at Niagara Falls, who spent eighteen months with the assistance of Messrs. St. George, McDougall and Shepard, in getting information which he obtained."

Mr. R. M. Wilson.

"The suggestion contained in your editorial in regard to research work on high tension transmission lines being carried out by properly qualified people, is undoubtedly a very good one, and it is certainly true that the only proper way of experimenting with high tension transmission lines is to carry out the work on same where you have the actual conditions under which the apparatus and lines are called upon to operate. There has already been carried out some research work along the lines which you suggest, but owing to the cost involved the experiments have not been carried out as they should have been, and I think that anything that can be done to follow out the suggestions contained in your editorial would undoubtedly be of great interest and importance."

Mr. K. L. Aitken.

"Would say that your suggestions with reference to research work to be carried out in connection with the transmission system, is a very good one, but I think you will find that as this line was built for commercial uses it cannot be spared for experimental work. However, this is a matter which you should take up with the Hydro-Electric Commission direct."

Professor L. A. Herdt.

"I have read with interest the editorial on high tension transmission published in the March issue of the Electrical News. The project that you suggest, viz., that some trained university research scholar be placed on the work of investigating various high tension phenomena under service conditions, is very much to be desired. The financing of such a project, however, should not be left, as has been too often the case, to the private initiative of self-supporting universities, or else to members of university staffs, who are sometimes asked to carry out work of great practical value without any inducement other than the interest of this work to the engineering community at large. The writer feels that not only in high tension transmission should such work be undertaken, but that there are numerous problems in engineering which require to be investigated under practical conditions. Universities can provide the trained men, if the government, corporations or companies will assist with necessary suitable grants. It must not be forgotten that the university laboratories have instituted the tests which have directed the development of the electrical industry, and are still capable of showing the further lines along which electrical engineering must progress."

Canada's Minerals in 1910

A preliminary report on the mineral production of Canada for 1910 places the total value for the year at $105,000,000, an increase of $13,209,507, or more than 14 per cent. over 1909. This increase is stated to have been fairly well distributed among the most important ores and minerals produced in Canada, and the following figures are given as expressing the values for the different provinces. It will be seen that New Brunswick is the only province showing a falling off.

Province	1909 Value	1909 Per cent of total.	1910. Value	1910. Per cent of total
	$		$	
Nova Scotia	12,504,810	13·62	14,054,534	13 38
New Brunswick	657,035	0 71	585,891	0 56
Quebec	7,086,265	7·72	8,193,275	7·80
Ontario	37,374,577	40 70	43,017,026	40·95
Manitoba	1,193,377	1·30	1,470,776	1·40
Saskatchewan	456,246	0·50	557,806	0·53
Alberta	6,047,447	6·58	7,876,458	7·50
British Columbia	22,479,006	24 48	24,547,817	23·37
Yukon	4,032,678	4·39	4,737,375	4·51
	91,831,441	100 00	105,040,958	100·00

Copper Production.

No refined copper is produced in Canada, but the copper ores are mostly reduced to a matte or blister copper carrying values in the precious metals. In Quebec where the copper is recovered subsequently to the extraction of the sulphur from pyritic ores, there was increased activity during the year. A small quantity of ore was exported from British Columbia coast mines and the Yukon to United States smelters for treatment. In Ontario, where the copper is chiefly recovered from the nickel-copper ores of the Sudbury district, there is a very large increase in production. In British Columbia the most important events during the year were the acquisition of a controlling interest in the Dominion Copper Company by the British Columbia Copper Company, with the subsequent re-opening of several of the properties, and the destruction by fire of part of the head works of the Granby Mines at Phoenix, B.C., which noticeably affected the output, although the Boundary district as a whole shows an increased production.

Statistics are not available at the present time to show the total quantity of copper contained in ores shipped from the mines. The total production of copper, however, contained in blister and matte produced and estimated as recoverable from ores exported was in 1910 approximately 56,598,074 pounds. In 1909 the production of copper estimated on the same basis was 52,493,863 pounds, an increased production of about 7.8 per cent., being therefore shown in 1910.

Of the production in 1910, Quebec is credited with 957,-

178 pounds; Ontario with 19,259,016 pounds; and British Columbia with 36,000,000 pounds. Ontario shows an increased production of about 3,512,317 pounds, or 22.3 per cent., while British Columbia shows a slight increase, the production in 1909 being estimated at 35,658,952 pounds.

The New York price of electrolytic copper during the year varied between the limits of 12 cents and 13¾ cents per pound, the average being 12.738, as compared with an average of 12.982 cents in 1909, 13.208 in 1908, 20.004 in 1907, and 19.278 in 1906.

The total exports of copper contained in ore, matte and blister according to Customs Department returns were 56,964,127 pounds, valued at $5,840,553. It will be noted that the exports agree very closely in number of pounds with the record of the production, which would be expected, since practically all the copper is exported.

Kaministiquia Progress

The gross revenue for 1910 of the Kaministiquia Power Company amounted to $191,283, as compared with $167,995 in 1909, and $130,444 in 1908. Operating expenses are exceedingly low, being $28,740, $23,826 and $17,502 for the same years, or slightly over 15, 14 and 13 per cent.

The power plant is situated at Kakabeka Falls on the Kaministiquia River. This river falls 180 feet in a distance of 6,500 feet, affording natural conditions exceptionally favorable for the economical development of hydro-electric power. The river has a drainage area, or water shed, of 2,800 square miles, including Dog Lake, Shebandowan Lake and other large lakes. The dams, intake and forebay, have been completed to the intended capacity of the plant, viz.: 30,000 h.p., the aqueducts 25,000 to 30,000 h.p., and the penstocks 15,000 to 20,000 h.p., of which there is now completely developed 15,000 electric h.p. The power house is constructed to accommodate an ultimate development of 30,000 h.p., with the exception of an extension of 100 feet for additional generators and water wheels. From the power house duplicate transmission lines run, at present equipped with circuits capable of transmitting in excess of 20,000 h.p., and by reason of the duplication ensuring continuous and satisfactory delivery of power.

The power house is situated 18 miles from the twin cities of Fort William and Port Arthur, which are only four miles apart from centre to centre. A terminal tower has been built a few miles out where the main line divides, one branch going to each city.

Among the larger power customers of the Kaministiquia Power Company are the City of Fort William for general municipal purposes, including the lighting of its streets, as well as its commercial and residential houses; the Hydro-Electric Power Commission of Ontario on behalf of the City of Port Arthur for the same purpose, and also street railway operation; this line has just recently been completed and placed in commission; the Canadian Pacific Railway Company for the operation of its extensive workshops, grain elevators, coal docks, etc.; the Ogilvie Flour Mills Company; the Grand Trunk Pacific Terminal Elevator Company; the Western Terminal Elevator Company; the Fort William Coal Docks Company, and the Consolidated Elevator Company.

The superintendent and secretary of the Kaministiquia Company is Mr. W. L. Bird.

February Progress at Point du Bois

Mr. W. G. Chace, engineer-in-charge of Winnipeg's municipal development, reported the following electrical progress during February:

Turbine room roof and turbine room floor, floors in high tension bus room and recording instrument room, low tension switch room, and several other considerable sections of the power house interior work were laid. The steel framing of five head gates was placed, as well as considerable sundry steel in other portions of the building. The ceilings of the generator room and the transformer room were lathed and plastered, and a start was made on the brick lining of the north wall of the generator room.

The Canadian Westinghouse Company have placed practically all of the conduit for the control cables. No. 5 turbine, two governors and spare runs for these turbines have arrived, as also has No. 1 generator, with the two exciter generators. The second generator has been shipped from England on the 24th of February. Mr. Thomas, of Messrs. Vickers Sons & Maxim, has arrived to take care of the erection of this machinery. The electric travelling cranes have been put into commission and the temporary plant for the driving of these cranes has also been completed, being put into service on March 4th.

Sixty-seven towers were assembled during February and there remain to be assembled after March 1st only 25 towers. 75 towers were erected and there remains to be erected a total of 90 towers. Preparations have been completed for the recommencement of cable stringing.

Fair progress has been made during February at the terminal station. Six 2,700 kv.a. transformers have been unloaded and set into their brackets. The Canadian Westinghouse Company have had a small gang of men continuously placing conduit in floors for control wiring. The electric travelling crane has been very satisfactory in operation.

At sub-station No. 2 forms for barrier work have been practically completed by the city construction engineer, and the high tension barriers have been poured. At sub-station No. 1 the Manitoba Bridge & Iron Works have begun delivering steel. The contract has been let to Messrs. J. McDiarmid Company for the construction of the superstructure. Three 500 kv.a. transformers have been moved by the Canadian Westinghouse Company into the terminal station craneway, where they are being dried out preparatory to assembly.

During February, tenders were accepted for the supply of conduit for 1911 from H. B. Camp Company, Akron, Ohio, and for the construction of conduit runs from G. M. Gest, Montreal.

The Power Commission Amendment Act, 1911

A bill to be known as The Power Commission Amendment Act, 1911, has been introduced by Mr. W. K. McNaught. The following important sections are contained in the proposed Act:

"Where a corporation has constructed or desires to construct works for conducting, furnishing or distributing electricity for light, heat or power purposes, where any other corporation has already constructed and has works for the like purposes, or any of them, upon the application of the first mentioned corporation and after notice to the other and hearing any objections which it may make, the Commission may, if it is of opinion that the location and mode of construction of such works are proper, approve of the same; and all works which such first mentioned corporation has contsructed or may thereafter construct, the location and mode of construction of which have been so approved, shall be deemed to have been constructed under statutory authority and to be lawfully constructed and may be maintained and operated by such corporation in respect of the construction, maintenance or operation of such works, any statute or law to the contrary notwithstanding.

"Where the Commission is of opinion that it is necessary or expedient, in order to prevent danger from contact between the wires of two corporations, or from any other

cause, that insulators or other appliances should be affixed to the poles of either corporation, or that the wires of either of them should be attached to such insulators or other appliances, the Commission may authorize or direct such insulators or other appliances to be so affixed, and such wires to be so attached in such manner as the Commission may deem best calculated to prevent such danger; and anything done by either corporation pursuant to such authority or direction shall be deemed to be lawfully done.

"Where the location and mode of construction of any works of a corporation which have been constructed before the passing of this Act are approved by the Commission, the approval of the Commission may be set up in and shall be available as a defence to any action now pending to the same extent and with the same effect as if such action had been commenced after the passing of this Act, and the giving of such approval; and where it is so set up, the plaintiff shall be entitled to discontinue the action, and, if he does so, to be paid his costs of it by the defendant.

"The Commission shall have exclusive jurisdiction as to all matters in respect of which authority is, by this Act, conferred upon it, and nothing done by the Commission within its jurisdiction shall be open to question or review in any action or proceeding or by any Court.

"No Court shall have authority to grant, or shall grant an injunction, or other order, restraining, either temporarily or otherwise, the construction, maintenance or operation of any works, the location and mode of construction of which have been approved by the Commission if the same are being, or have been, constructed in the place and according to the mode which have been so approved."

Ontario Telephone Act 1910

"The Ontario Telephone Act, 1910," is to be amended by the addition of several sections. Mr. S. Charters introduced the bill. Among other matters the Railway and Municipal Board is given power to prescribe standard conditions and specifications of construction, equipment and maintenance of all Ontario telephone systems. They may, if deemed necessary, render advisory or supervisory assistance to any such telephone system or may require at any time a report on any system. Yearly reports are to be furnished to the Board by all telephone companies. Lines may be arbitrarily extended to make necessary connections between any two adjoining systems.

The Lieutenant-Governor in Council must also approve any transfer of ownership or control to any company not within the jurisdiction of the Ontario Legislature. This section of the bill is worded as follows:

"Notwithstanding anything in any Act contained, no company or person or persons owning a controlling interest in any telephone system within the Legislative jurisdiction of Ontario, shall sell or transfer such system or controlling interest therein to, or amalgamate with, or enter into any agreement or arrangement which shall, in effect, transfer the ownership or control of such system or controlling interest therein, to any company or corporation which has been declared to be a work for the general advantage of Canada or which is not within the Legislative jurisdiction of Ontario, until the Lieutenant-Governor in Council has approved of such sale, transfer, amalgamation, agreement or arrangement."

The Act to Equip Vessels with Wireless

The Act which has been introduced in the House of Commons, Ottawa, by Mr. Brodeur, to amend the Telegraphs Act, reads in part as follows:

1. No steamer, whether registered in Canada or not, carrying passengers and carrying fifty or more persons including, passengers and crew, shall leave or attempt to leave any Canadian port unless such steamer is equipped with an efficient apparatus for radiotelegraphic communication, in good working order, capable of transmitting and receiving messages over a distance of at least one hundred and fifty miles by night or by day, and in charge of a person fully qualified to take charge of and operate such apparatus.

2. The owner, master or other person in charge of any steamer which leaves or attempts to leave any Canadian port contrary to the provisions of this section shall be liable to a fine not exceeding one thousand dollars and costs, and such fine and costs shall constitute a lien upon such steamer.

3. This section shall not apply to steamers plying between ports not more than two hundred miles apart.

The Minister of Naval Service may make regulations to:

(a) Compel any special coast stations to transmit messages to and receive messages from any specified ship stations, in accordance with such regulations;

(b) Compel any specified ship stations, within the territorial waters of Canada, to transmit messages to and receive messages from other specified ship stations, and to and from specified coast stations, in accordance with such regulations;

(c) Compel all Canadian ships, wheresoever they are, to exchange messages in accordance with such regulations;

(d) Provide how radiotelegraph apparatus installed upon any foreign or British ship (whether such British ship is registered in Canada or elsewhere) shall be operated while such ship is within the territorial waters of Canada.

Progess in Ottawa Storage System

The Department of Public Works has called for tenders for the construction of a storage dam at the foot of Quinze Lake, the estimated cost of which is $59,000. The dam will be located about eighteen miles above Lake Temiskaming. It has been found that the most suitable site for a dam to retain and control the waters of Quinze Lake, as well as the waters of Lake Expanse, is near the head of two large islands situated at the outlet of Quinze Lake where the water enters the Quinze rapids, thus closing the three channels formed by these islands and the main shore on either side. The main or centre channel will require a dam 2,100 feet in length, the north channel a dam 250 feet long, and the south a dam of 600 feet, making 2,950 feet of dam altogether. The area of water that will be controlled by these dams will be 96 square miles, with a reserve capacity of 13,381,632,000 cubic feet of water. Tenders will also be called this spring for the new dam at the head of Gordon Creek, which it is expected can be rebuilt from the present Lumsden estate dam, for a cost of about five thousand dollars.

A Diesel Oil Plant

The municipal lighting plant at Yorktown, Sask., is nearing completion and is expected to be in operation during the present month. Series tungstens will be used for the residential streets and ornamental posts, similar to those installed in Ottawa, for the business section.

The prime mover in this plant is a Mirrlees Diesel crude-oil engine, the first of its kind to be installed in Canada. It is a three-cylinder 150 h.p. engine, direct-connected to a Siemens Bros. 3-phase, 60 cycle, 2200 volt, 257 r.p.m., 80 kv.a., revolving field type alternator. The secondary circuit is 110 volts.

Mr. C. W. Abbott, of Pittsburg, Pa., representative of the National Metal Molding Company, of that place, recently gave an address and demonstration before the Electrical Association of the Province of Quebec, in their room, Royal Arcanum Chambers, Montreal.

A Bending "Hickey" for Heavy Conduit

There is always more or less difficulty in every large construction job where there is any amount of conduit, in making offset and other bends not covered by the standard right angle bends. This difficulty was surmounted in one instance by the method illustrated herewith. Two blocks about eighteen inches long were held about forty inches apart by planks nailed solidly to the blocks. One end of the blocks was placed against the wall, and against the other end, which was slightly grooved, was placed the pipe to be bent. Against the pipe was placed the bending tem-

Improvised Hickey for Bending Conduit

plate, which in this instance was of eighteen inches radius for two inch pipe and nine inches radius for one and one-quarter inch conduit. It is quite necessary that the bending template have a "V" shaped groove cut in it to prevent the pipe from buckling. A regulation track jack with one man on the lever furnished the power for the bending, which was done very quickly and neatly, no buckling whatever being noticed in any of the bends, some of which were almost at right angles. Two men completed fifty bends in the two-inch conduit in a little over a day, and much of this time was lost in fitting the conduit into the junction boxes.

Montreal and Southern Counties Extension

The Montreal & Southern Counties Railway has applied to the Board of Control of Montreal for permission to extend its line into the heart of the city. The request is for power to build lines on St. Paul, Inspector, Laganchetiere, Cathedral, Burnside, Stowley, Osborne and Mountain streets in such a way as to give the company a belt line, tapping the railway and hotel centres and accommodating a certain amount of summer tourist trade. The new tracks would pass along several narrow thoroughfares and cross the tracks of the M. S. R. several times. The matter has been referred to the city engineer.

The same company is getting material ready for the extension of its line from St. Lambert to Chambly Canton, Chambly Basin and Richelieu, a distance of about thirteen miles. Work will be begun as soon as the frost is out of the ground. A branch will also be run out from St. Lambert station to the Montreal Country Club and the golf links, about a mile and a quarter. Parties will also be sent out early through the counties of Laprairie, Chateauquay and Huntingdon to locate lines for extensions that will touch all the principal centres in these counties. Orders have been given for thirteen new coaches, including passenger, freight and combination cars. A new freight and a combination are due very shortly.

Montreal L. H. & P. Co. Wins Again

An injunction asked by the Montreal Light, Heat and Power Company restraining the Montreal Electric Light Company from placing poles and wires in such a way as to interfere with the former's lines has been granted by Mr. Justice Davidson of the Supreme Court. The order enjoins the Montreal Electric Light Company: "Within one month from the service upon them of the present judgment to remove all poles which project through the wires of petitioners; all wires whether primary or secondary (the latter term including wires from transformers into buildings and wires carrying less than 600 volts) which are within 3 feet of the primary or secondary wires of petitioner's existing system."

Wires Blamed Again

Electric wires were again wrongly blamed, as they have often been before, for a fire that broke out early on the morning of March 8, in the Day Nursery at Montreal. When the firemen looked for the cause they found electric wires under the flooring and this led to the announcement in the daily press that imperfect installation probably caused the fire. Mr. W. B. Shaw, of the Montreal Electric Company, was called in to make an investigation, and discovered that the house wires had never even been connected with the feed wires.

Weekly Luncheon for Electrical Men

The Montreal members of the Electrical Association of the Province of Quebec have just introduced a popular innovation in the form of a weekly luncheon at "Cooper's," on Wednesday at noon sharp. Special accommodation at a fixed mderate price has been arranged for and visitors in

Mr. N. Simoneau, President

the trade will always be welcome to join the group. Topics of interest to the trade will naturally be the topic of conversation and the intention is shortly to introduce fifteen minute talks at the close of the luncheon. It is desired that it be understood this is not a contractors' association, as all electrical workers, including supply men, engineers, etc., are eligible and welcome.

Will Develop Quinze Rapids

A bill incorporating The Development Company of Canada has passed its third reading in the Quebec legislature. The company is authorized among other things to develop water power and produce gas, electricity, heat, or initiate power and maintain and operate power houses and other works for the production of electric, hydraulic and other power or force, and to construct mains, pipes and conduits for the transmission of the product. In the discussion of the bill it was stated that the real purpose of the company is to develop very extensive water powers at the Rapids des Quinze, Pontiac County, and to sell the electric and other energy to Cobalt. The provincial directors are given as R. H. Weldon, financial agent; Chas. W. Batho and W. B. Smith.

Growth of Winnipeg Electric

The following figures indicate the growth of the Winnipeg Electric Railway as regards passengers carried and gross earnings during the past five years:

	Passengers Carried	Increase per cent.	Gross Earnings.	Increase per cent.
1906	17,229,556	31	1,416,305	26
1907	20,846,317	21	1,722,406	21
1908	22,019,507	5	2,206,094	28
1909	26,382,773	19	2,623,731	18
1910	31,369,421	18	3,284,341	25
Increase in five years		82		131

As it is probably safe to assume that the population of the city has increased in almost the same ratio as the number of passengers carried, it will be seen that the city is making remarkable progress. From the above it will also be noted that whereas the number of passengers carried has increased 82 per cent., the gross earnings, which include sale of gas and electric power, have increased 131 per cent., showing a large increase in the amount of power and gas used by the consumers, since there has been no increase in power rates.

Halifax Electric Annual Statement

The report of the directors of the Halifax Electric Tramway Company as presented at the annual meeting showed net earnings for the year $200,474.61, an increase of $22,502.82. The year's surplus was $102,474.61. The total earnings for the year were $477,109.96, an increase of $30,-539.22. The operating expenses were $246,633.45, an increase of $7,028.40. The proportion of the operating expenses to income was reduced to 51.94 per cent. During the year 4,-848,767 passengers were carried, an increase of 283,459.

Kingston Annual Report

The annual report of the Kingston light, heat and power plant for 1910, shows net profit of $18,000. The cost of producing electricity last year was reduced a quarter of a cent a kilowatt hour, from 1.84 to 1.61 cents

American Institute Meeting in Toronto

The 260th meeting of the American Institute of Electrical Engineers will be held in Toronto on April 7th in lecture room No. 22, Chemistry and Mining Building, University of Toronto. W. S. Murray, Electrical Engineer, of New York, New Haven & Hartford Railway, will present a paper entitled "Analysis of Electrification, and its Practical Application to Trunk Lines for Freight and Passenger Operation." Mr. Murray is an authority on this subject and the meeting should prove of decided interest to all men interested in railway work. The meeting is open to all who may be interested.

A Large Mississippi Development

The Mississippi River Power Company, formed in 1910, will build and operate a hydro-electric plant on the Mississippi River near Koekuk, Iowa, situate about half way between Kansas City and Chicago. The company's plan of operation provides for the construction of a dam of solid masonry some 4,700 feet in length. A power house will be built of steel and concrete designed for the ultimate utilization of thirty units of a rated capacity of 10,000 h.p. each. Active construction work was begun in January, 1910, and is proceeding steadily. An initial development of 120,000 h.p. is planned, to be completed by July 1, 1913. An ultimate capacity of 200,000 h.p. is proposed to be developed.

The Stone & Webster Engineering Corporation will have direct charge of the electrical installation, including the transmission and distribution lines. The board of directors includes two Canadians, Alexander Laird, general manager Bank of Commerce, and G. A. Morrow, vice-president Dominion Securities Corporation.

Electrical Engineering Exhibition

The Third Triennial Exhibition of Electrical Engineering and Machinery is to be held at Olympia, London, this year, from September 23 to October 21, both dates inclusive. It is to be international in character. It is stated by the manager that this exhibition is in no way proprietary, but is a manufacturers' exhibition, promoted by the large electrical manufacturers of Britain, through their association, the National Electric Manufacturers' Association (Inc.). All the exhibiting firms will participate in the profits, if any, arising from the exhibition, although their liability is limited to their space rental, which is advertised not to be in excess of those of any similar exhibition.

The forthcoming exhibition, it is stated, will be the largest event of the kind which has ever been held in England, and perhaps in any other country. The fact that this event will take place in the coronation year, it is urged, is also strongly in its favor, as there will be a large number of colonial buyers visiting in London, who will embrace the opportunity of visiting such an important undertaking, in which many of them will be keenly interested.

Keyless Sockets in all Bathrooms

The electrocution of Har.y Medwell, a C. P. R. dining car conductor, by touching the exposed contacts of a "Hylow" type of lamp while in a bath tub has led to a thorough investigation of wiring in residences in Winnipeg, with the result that a by-law has been passed providing that all bathroom lights have keyless sockets, and be controlled from a switch located outside the bathroom, and that the use of lamps with bases exposed below sockets be prohibited.

A Western Wireless System

A wireless system has been established between Athabasca Landing and Little Slave Lake, three steamers of the Northern Transportation Company, of Winnipeg, being equipped with the wireless apparatus.

A jury in the Supreme Court before Mr. Justice Clement returned a verdict for the plaintiffs in the case of Moore vs. Vancouver, an action for damages for injuries sustained by the plaintiffs, Mr. William Moore and his wife, when a carriage in which they were driving on Powell street was struck by a street car. The jury awarded the husband $1,000, and the wife $1,500. The British Columbia Electric Railway Company was joined as a defendant.

Municipality Leases Plants to Private Company

The Moncton Tramway, Gas & Electric Company will install during the coming summer in the city of Moncton about six and a half miles of single track railway and on the 26th of March they take over on lease the electric light and gas plants owned and operated by the city. To furnish current for tramway they will install a motor generator set, transforming the a.c. current of the electric lighting plant to 550 volt d.c.

This company also own the natural gas in Albert County, ten miles from Moncton. A main pipe line will, this summer, be put down, through which the gas will be forced at about 30 lbs. pressure, and distributed throughout the city at low pressure in about thirty miles of pipe. The prices at which they have offered gas are attractive, being thirty cents per thousand cubic feet for manufacturing, and forty-five cents for heating purposes. Their intention is to use the gas for the present as fuel under the boilers at the electric generating station and eventually replace the present steam engines with gas engines. Mr. E. A. Mitchell, of London, Eng., is the consulting engineer and W. D. Ritchie is resident engineer, both being in Moncton at present.

Reversing Falls of St. John

About two miles from where the River St. John enters the Bay of Fundy the river drops over a fall of about 20 feet, but as the St. John River is a tidal river and the tides of the Bay of Fundy are from 30 to 60 feet the maximum of fall is at low water or when the tide is out completely. At flood tide the water has reached the top of the fall and the river and tide is at a level. At high tide the fall is the other way that is, up the river, with the water flowing in the opposite direction to the fall at low tide. This makes what is called the reversing falls of St. John.

A large number of plans have been proposed to make use of the water power at the falls, but without any of them being considered feasible. There is only twice in the twenty-four hours that the maximum power is available, that is at low water and, of course, a part is available for a longer or shorter time. But at about half tide when the tide and the water of the river are both at the same level, there is no power available. At high tide there is also power, but it will need a second equipment to make use of it. A large holding basin is proposed to make use of the tidal power but the very high cost of this makes it almost prohibitive

4,000 h. p. on Eel River

Messrs. H. A. Connell and Geo. McPhail, of Woodstock, and John G. Murchie, George A. Murchie and Geo. A. Andrews, of St. Stephen, are applying to the New Brunswick legislature at Fredericton for an Act to incorporate the Eel River Light, Heat & Power Company. Capital stock, $300,-000. They are asking for power to develop the water power on the Eel river and lakes thereon and to build transmission lines to Fredericton, Woodstock, St. Stephen, St. Andrews, and McAdam. The promoters estimate that they can develop 4,000 h.p. and that they will have a head of 70 feet. If they obtain their charter the work will proceed during the coming summer.

Municipal Plant for Edmundston

The town of Edmundston has made application to the New Brunswick legislature for permission to install a municipal plant. It is expected that the installation will be put in this summer.

The British imports of carbons for electric lights amount to nearly fifty millions a year.

Personal

Mr. F. Trudel has been appointed city electrician of Hull, Que.

Mr. L. B. McFarlane, general manager of the Bell Telephone Company of Canada, will in future be known as managing director.

Mr. C. W. Davidson, local manager of the Bell Telephone Company, Ingersoll, has been transferred to the district office at Woodstock.

Mr. C. F. Sise, Jr., has been made general manager of the Bell Telephone Company in Canada. His former office of general superintendent has been abolished.

Mr. R. Colby, formerly superintendent of the Bethlehem Light, Heat and Power Company, of Bethlehem, Pa., has been appointed chief operator at the power station on Horton street, London, Ont.

Mr. Chas. A. Magrath, M.P. for Lethbridge, recently addressed the Canadian Club of Montreal on "Western Water Questions." Mr. Magrath is entirely opposed to the exportation of any of Canada's hydro-electric power.

Mr. G. R. G. Conway has been appointed chief engineer for the British Columbia Electric Railway Company and all its subsidiary concerns. Mr. Conway is an engineer of note, having been in charge of the installation of the waterworks system of Aberdeen, Scotland, as well as different large undertakings in Mexico.

Mr. Geo. D. Perry has been appointed general manager of the Great North-Western Telegraph Company, head office, Toronto. Mr. Perry has been with the company since its organization, working up from the bottom. He is a Canadian, born in Whitby, Ont., and began his business career with the Standard Bank of Canada.

Mr. M. H. Smith, who has for the past year been district manager of the Nernst Lamp Company, in Montreal, P.Q., has tendered his resignation in order to engage in the mercantile and electrical supply business, with offices in Edmonton and Calgary, Alta. Mr. W. J. Baird, late of Business Systems Limited, Toronto, Ont., will be associated with Mr. Smith.

Mr. Chas. F. Gray, for the past five years superintendent of construction for the Canadian Westinghouse Company, with headquarters at Hamilton, Ont., has been transferred to the Winnipeg office of the above company to take charge as chief engineer of the Canadian Westinghouse Company's construction staff, erecting switching and transforming apparatus at the City of Winnipeg's 60,000 h.p. hydro-electric plant at Point du Bois, Manitoba, and the terminal station and sub-stations in the city of Winnipeg. Mr. Gray's headquarters will be in the Westinghouse Building, Winnipeg.

Severe Service Switch.

The Detroit Fuse and Manufacturing Company have placed on the market a new type of Detroit switches known as the Severe Service Junction Box Switch. In addition to being an ironclad fused switch, this device provides for the branching out of circuits in all directions and for the main lines passing entirely through the box under the porcelain base. The Detroit Severe Service switch is a quick make and break switch, positive in its action, and controlled instantly from the outside of a cast iron box. All working parts are of phosphor bronze, making rust proof design, and the switch is equipped with gaskets, giving a water-tight construction. It can be installed out doors or where directly exposed to water, steam, fumes, or any other extreme conditions. This switch is especially desirable for engine house service and is being adopted by prominent railroads as part of their equipment. A cut of the new switch is shown.

Electric Plant of I. C. R. Shops at Moncton

In the Intercolonial Railway shops at Moncton, New Brunswick, power for operating the numerous motors is supplied by two 500 horse power producer gas engines manufactured and installed by the R. D. Wood Company, Philadelphia. The two corresponding generators are Westinghouse type, direct connected, three-phase, 60 cycle, 230 volts, each 300 kilowatts normal capacity. A Bullock motor generator

Chief Engineer Rolfe

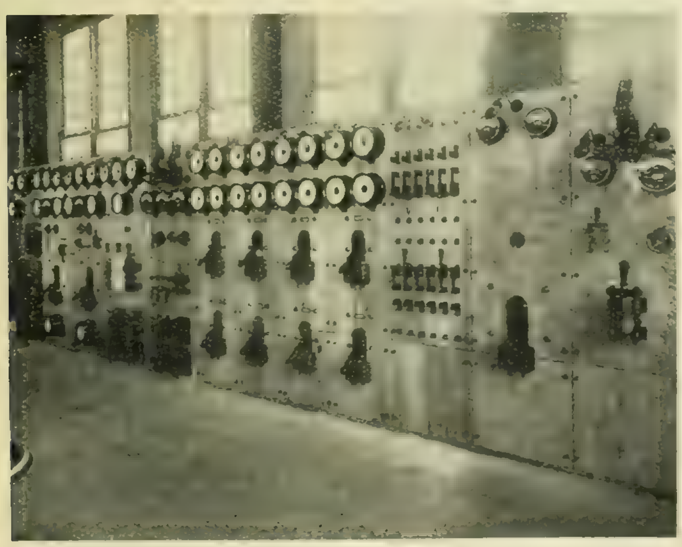
set of 200 kw. capacity supplies direct current at 220 volts to all the crane motors.

The current for lighting the general offices and shops is supplied by a separate installation consisting of a 150 horse power Robb engine direct connected to a Canadian General Electric 105 kw. generator.

The total number of motors distributed throughout the shops is 210, nearly all of which are direct connected to the individual machines they operate.

Wiring is all in conduit with condulet outlets. Where wires run from one shop to another all work is underground.

The capacity of the gas plant is 1,200 cubic feet per minute of producer gas and 220 feet of water gas, costing a little over 6 cents per thousand cubic feet. In the near future the Moncton Tramway, Gas & Electric Company will be



Switchboard, I. C. R. Shops, Moncton, N. B.

delivering natural gas in the city, and it is the present intention of the I. C. R. management to use the natural gas instead of the producer.

The following figures, indicating the cost of operation of the gas producer plant during the last five months of 1910, are valuable as showing the distribution of the expenses as well as the low figure at which such a plant may be maintained. During the months of August and September the plant was only operating about half capacity, but it will be seen that during the last three months of the year, when conditions were about normal, the average cost per thousand feet of gas generated was only 6.2 cents.

Cost of Operating Producer Plant for Five Months.

	Aug.	Sep.	Oct.	Nov.	Dec.
Wages	$293.52	$304.76	$323.45	$311.10	$284.65
Coal at $3.85 ton	333.03	324.36	395.59	515.90	585.20
Coke at $4.95 ton	39.60	39.60	39.60	39.60	39.60
Water Estimated	120.00	120.00	120.00	120.00	120.00
Repairs "	100.00	100.00	100.00	100.00	100.00
Oil, waste, etc...	4.20	4.20	4.20	4.20	4.20
Electric power	75.00	75.00	75.00	75.00	75.00
Compressed air on Sundays ..	15.00	15.00	15.00	15.00	15.00
Capital; interest and depreciation	250.00	250.00	250.00	250.00	250.00
Total..	$1,230.35	$1,232.92	$1,322.84	$1,430.80	$1,473.65

Generating Room, I. C. R. Shops, Moncton, N. B.

	Aug.	Sep.	Oct.	Nov.	Dec.
Million feet of gas made	11	12½	21½	21	26
Cost per 1,000 cubic feet in cents	11.2	9.9	6.2	6.8	5.7

Average cost for the five months per 1,000 cubic feet equals 7.27 cents.

Average cost for last three months equals 6.23 cents.

Large Plant for Japan

Messrs. Escher Wyss & Co. have been awarded the contract for six double high pressure water turbines, complete with oil-pressure governors and pressure regulators, each designed for 12,500 h.p. under a head of 1,100 feet. The two exciter turbines will be of 1,200 h.p. each. These turbines will be installed at the Kinugawa power station, Japan, which when completed will figure among the most important power plants ever built. The same company have also secured the contract for three single Francis turbines of 1,000 h.p. each and two exciter turbines, all on vertical shafts, which are to be installed at the Gokak Mills in India.

Exhaust Steam Turbine in Regina

To Regina probably belongs the honor of being the first Canadian town to install an auxiliary steam turbine generator set for operation on low pressure exhaust steam. This unit was installed in Regina on April 1, 1910, and since that date, as shown by the load curves given herewith, has proven its ability under favorable circumstances of developing a load equal in amount to that of the original engines from which it uses the exhaust.

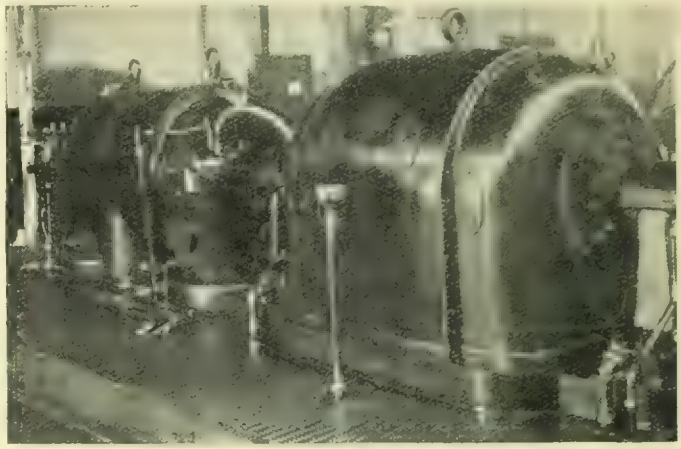
The original engine units were as follows: a 22⅞-in. by 30-in., 150 r.p.m. Corliss, connected to a 300 kw. generator; an 11-in. and 20-in. by 14-in., 277 r.p.m. Ideal engine connected to a 100 h.p. generator and a 9-in. by 9-in. Sturtevant engine, 180 r.p.m., which operates the condensing outfit.

The turbine unit is designed to take all the exhaust steam from these three engines if necessary, working it down from atmospheric pressure to 28-in. vacuum. The turbo-generator is 500 kv.a. 2200 volts, 60 cycle, 3-phase, Westinghouse manufacture, and delivers energy to the same bus bars as the engine units. The turbine is designed to develop this full load with 15 pounds inlet pressure.

The load curves shown are very interesting as representing the actual work this type of installation will perform. By a special arrangement of switching the engines and the turbines were placed on separate graphic recording integrating wattmeters for a number of hours over the evening load. On this particular occasion the whole of the exhaust steam from the 300 kw. engine and from the 9-in. by 9-in. Sturtevant, but not from the 100 kw. engine, was passed turbine, which was thus in competition with the 300 kw. engine operating non-condensing and the 100 kw. engine operating condensing. It will be seen that at peak load the capacity of the plant was just doubled by the addition of the turbine generator unit.

It will be noticed that the chart of the engine load shows a much broader line than the turbine load. This is partly accounted for by the greater sensitiveness of this instrument, but is mainly due to the engine governor feeling of the load, the changes of steam exhausted being smoothed out by some 30 feet of 14-in. pipe connecting the engine and turbine. With this engine-turbine combination a load of 934 kw. gives a water rate of 17.35 lbs. per kw. hour, as measured by switchboard integrating wattmeter, and water meter on condensed steam.

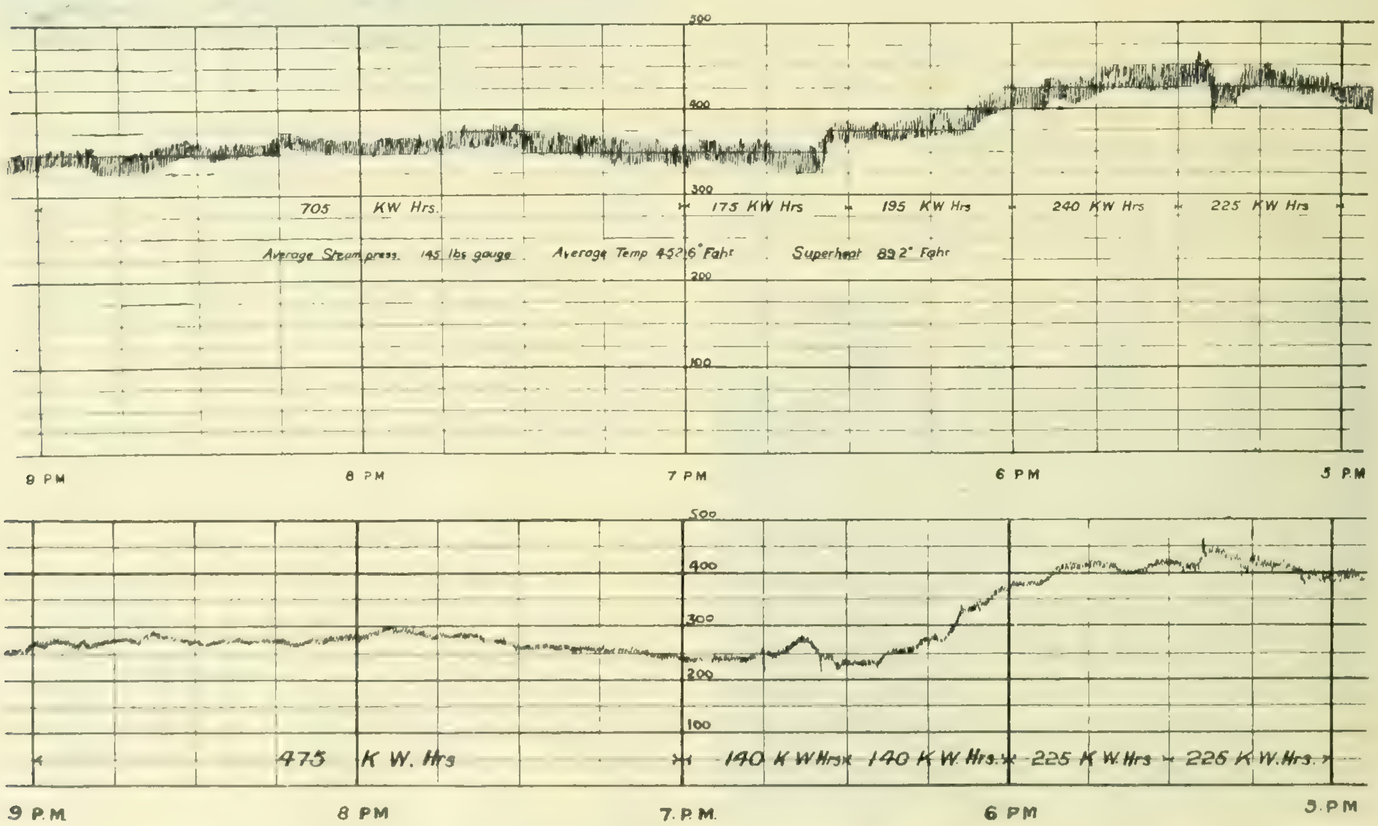
There has been no difficulty in governing, in fact it is



Exhaust Steam Unit in Regina

better than before the turbine was installed. The turbine is governed perfectly by the 100 kw. unit up to 225 kw. total load, when working on its exhaust along with condenser engine exhaust.

This plant is operating under the supervision of Mr. E. W. Bull, city electrician of Regina, to whom we are indebted for the above valuable data.



Comparative Load Curves of Steam Engines (above) and Exhaust Steam Turbine (below)

The Makers of Electrical Canada 7

WILLIAM C. HAWKINS—MANAGER AND ENGINEER

The man who can successfully develop a public utility, who can turn darkness into light, shorten long weary hours of rural transportation into minutes, bring factories into being by an ample supply of power, a man who by increasing the moral and intellectual capacity of his fellowmen for producing good work causing to grow not two only, but many blades of grass, where only one grew before, is a public benefactor of the best type this world has yet produced, ranking in no wise second to any of the other professions which work often with more ostentation but often, in the end, with far less effect.

It is one of the ironies of this socialistic age that the onlookers, the crowd that watches the game, who have profited probably to the greatest extent, show least evidence of appreciation of the changes wrought during the last few years by our public utilities. There is no gratitude to the men who played the game; no appreciation of the fact that the participants threw their whole fortune and their whole life into it; no thought that these men played the game because they loved to win fair battles and bring honor to those they served. The crowd with utter selfishness monopolize all the fruits of the victory and, adding insult to injury, curse the very men who have won for Canada the most glorious commercial victories.

It is quite as true in the game of every day life as in the field of sports that the man who plays the best game is the one who forgets himself most completely in his desire to play fair and win, for the sake of his town, city or province, the constituency which, for the time being, he represents.

A dozen years ago Hamilton showed little sign of the manufacturing and industrial activity which characterizes that city to-day. It wakened one morning to find light and power and electric railways knocking at its doors for entrance. The transformation that has been wrought there in the last decade is a perpetual monument to the clear grit of the handful of men who risked practically all their wealth and have given since most freely of their fortune and their time to make Hamilton the progressive city it is. It is pleasant to note at this time that the citizens appear to appreciate, above the average of to-day, the service of this pioneer company throughout the years when their city was in the making and refuse to compete them out of existence without a fair consideration of their rights.

It must not be overlooked that the industrial prominence of Hamilton to-day is due almost in its entirety to the fact that it got power before other cities. The company which brought it in was a pioneer. The development at De Cew Falls and the high voltage transmission line to Hamilton was, at that day's stage of engineering development, a decidedly venturesome expenditure. Further credit, therefore, is due this company for the educative effect of their successful installation and for the experience gained, which has doubtless been a large factor in the development of other Canadian plants in more recent times.

The success that has resulted in the present magnitude of the Dominion Power & Transmission Company's operations has been evidenced, from within, by the large and frequent increases to capital account and by corresponding increases in earnings which have resulted in the widening of the company's operations in all of the various branches of electric development, supply of light and power, and street railway service, until in point of magnitude this enterprise ranks with similar ones in the largest cities in Canada. In 1899 the capital stock was $250,000; it is now, including bonds and preference stock, about $18,000,000. During the same time yearly gross earnings have increased from about $100,000 to $1,925,000 in 1910. The plant at De Cew Falls, aside from smaller auxiliary plants, is now developing 36,000 h.p. and is at the present moment being increased by the addition of two 6,400 kw. generating units. The lighting and power requirements in Hamilton, Dundas and Brantford are served, as well as in many smaller towns and villages by the way. Their railway system comprises over 110 miles, including urban and interurban lines in and between the same cities and with branch lines so arranged that an area of approximately 600 square miles is served with modern conveniences.

Mr. William C. Hawkins

And now a word of the man who for a decade has been the central figure in this game of progress, Mr. William C. Hawkins, the general manager and secretary of the company. Mr. Hawkins was born in Orange, New Jersey, in 1862, attended the public school in Taunton, Mass., and later the Cohannet Grammar School and the High School at the same place, from which he entered the Stevens Institute of Technology at Hoboken and was graduated a mechanical engineer, with the degree M.E. The two following years were spent with the Campbell Printing Press & Manufacturing Company of New York. Following this he was appointed assistant engineer in the Third Avenue Cable line in New York city. In January, 1891, Mr. Hawkins entered the employ of the General Electric Company of Schenectady, N.Y., where he rendered valuable service in a number of their subsidiary companies, the Plymouth Electric Light & Power, the Concord Land & Water Company, of Concord, N.H., and the Columbia

Water Power Company of Columbia, S.C. Later he was engineer, for the same organization, of a committee on local companies which had about eighty corporations under its charge, where he had much to do with the reorganization both financially and physically of a large number of these, and with their later successful operation.

Since July 1, 1901, he has had charge in Hamilton, with the success already noted, of the varied interests which now constitute the Dominion Power & Transmission Company. Electrical Canada in the making was indeed fortunate in securing a citizen who combined such forward engineering experience with such marked constructive ability.

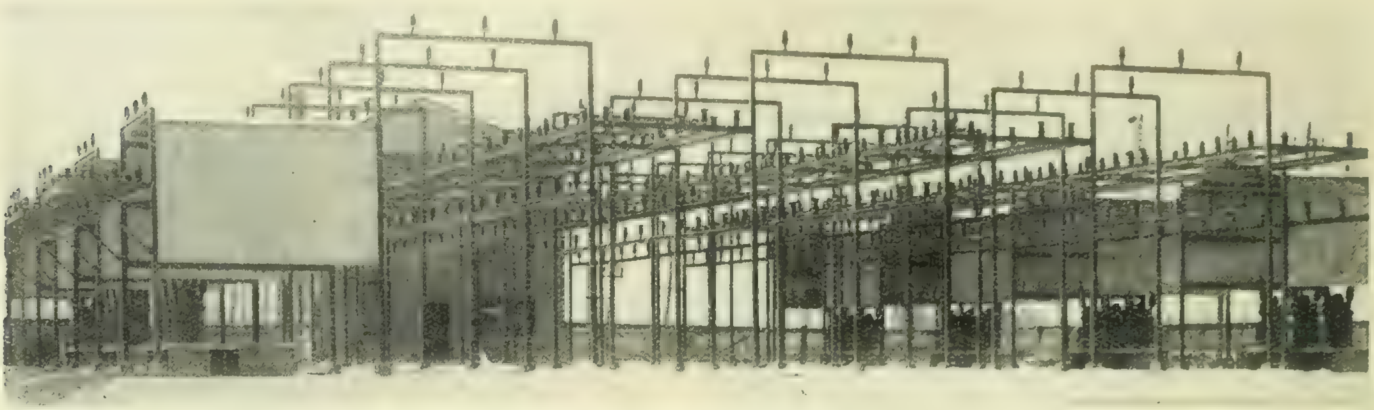


Fig. 1— General View, Dominion Power and Transmission Company's Out-door Switching Station at Bartonville.

Hamilton's Out-door Switching Station

The Largest in North America—Distributing Centre for 44,000 Volt Lines from De Cew Falls—Oil Switches only Semi-protected—All Other Apparatus Quite Exposed

The Dominion Power & Transmission Company has just placed in operation its new outdoor switching station at Bartonville, described in part in a recent issue of the Electrical News. In this matter the Hamilton company is again a pioneer, for, although such stations are in operation in various parts of Canada in a small way, the Dominion Power & Transmission Company is the first in Canada, and probably in North America, to attempt outdoor switching operations on such a large scale. The value of such a station is primarily a saving in cost of construction. A natural sequence, however, to the fact that room need not be economized is the wider spacing of the high tension apparatus, thus insuring better and safer operating conditions. It is evident also from the photographs shown that an operator can keep the various points in his station in better view; the better lighting is also a factor. The chief objection seems to be the inclemency of the weather, especially the Canadian winter.

Fig. 2. Looking up into busbars and insulators

All the main 44,000 volt lines enter this station direct from De Cew Falls, some 35 miles distant, and from this point the lines radiate out in different directions to feed the company's varied enterprises.

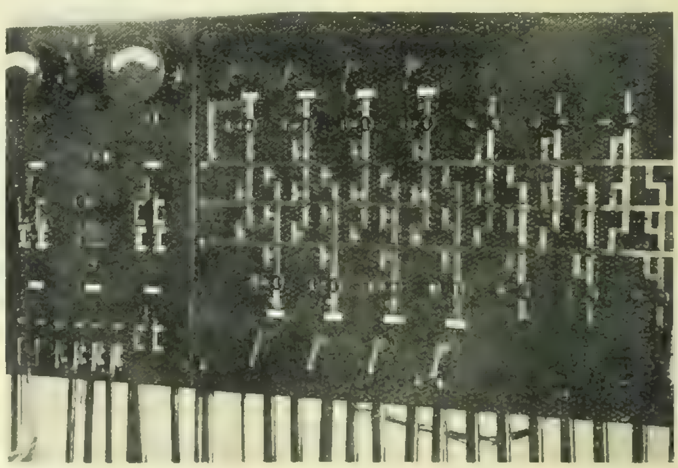


Fig. 3. Control Switchboard

The selector switches, of which there are in the neighborhood of 135, are mounted with the bus bars on structural steel framework. The oil circuit breakers are placed on concrete platforms raised some three feet above the ground and are semi-protected by a 5-inch concrete wall and roofing, as shown in the figures. The station consists of three separate 44,000 volt busses, in which both incoming and outgoing lines may be connected by means of three-pole, swivel-type, selector switches operated through a system of levers from the ground. Each line is controlled remotely by an

automatic circuit-breaker, equipped with selective relays of the inverse time-element type, so that the several outgoing lines may be set to open at varying time intervals.

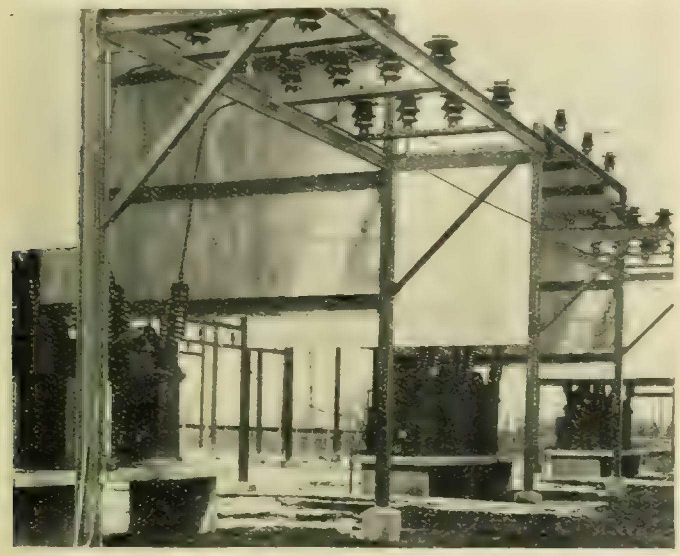


Fig. 4.—Three Groups of Oil Switches

In addition to the line circuit-breakers and mounted so that it may at any time be used in place of any one of them is a similar breaker which is used for paralleling any two lines or groups of lines. The method of connecting this circuit-breaker can be seen by noting the end switch shown on the control panel. Under normal conditions the two incoming lines, or trunk lines, are tied together through this breaker, so that in the event of line trouble on either of them it is automatically cut free from the switching station when the paralleling switch opens.

The station is built on the unit principle, so that new lines may be taken care of by simply adding a corresponding number of bays with auxiliaries, etc.

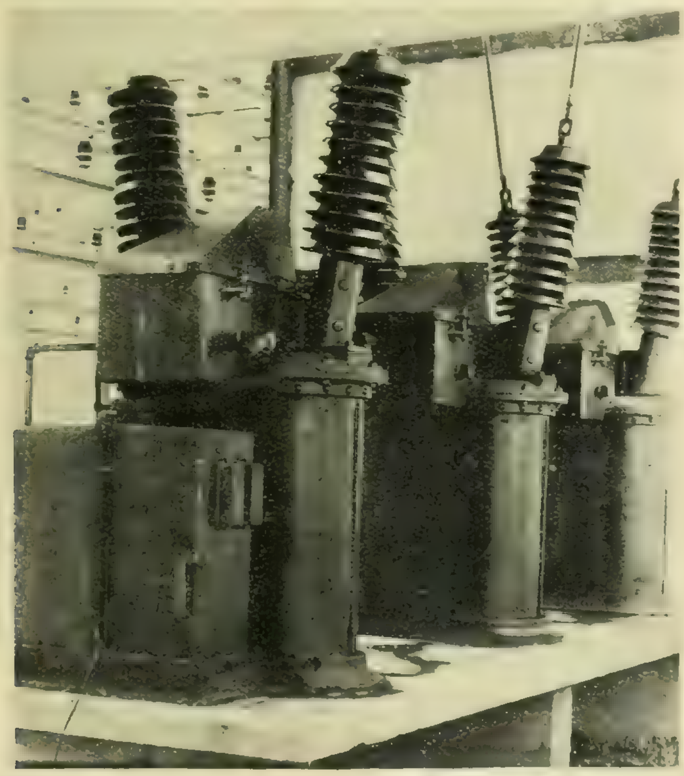


Fig. 5.—Close View Westinghouse Oil Switches

The selector switches are novel in some particulars, and were described and illustrated in a previous issue of the Electrical News. They are made as a three-pole unit, all three poles opening simultaneously, the center insulator being capable of rotation through an arc of 70 deg. and carrying the blade with it. A bell crank and shaft arrangement operated by a detachable lever and locking device controls the switches from below. These switches were designed and made by the company. The oil circuit-breakers were specially designed for this plant by the Canadian Westinghouse Company and are similar to their regular type G. A. switch, with the exception that additional insulation and porcelain rain shields are placed on the condenser bushings. They are rated at 300 amperes and 44,000 volts. The toggle mechanism is housed in a weatherproof casting.

Five photographs of the station are reproduced herewith. Figure 1 gives a general view of the station. Figure 2 is a good view looking upwards into the high tension bus bars and insulators. Figure 3 shows a near view of the control switchboard. Figure 4 represents three consecutive groups of three each oil circuit-breakers. Figure 5 is a close view of one of the oil circuit-breakers.

Trade Publications

Chapman Lightning Arrester—for telephone and telegraph lines—an illustrated bulletin issued by the Minnesota Electric Company, Minneapolis.

The Hear-a-Phone—booklet by the Stromberg-Carlson Telephone Manufacturing Company, descriptive of an instrument calculated for the use of deaf people.

Rand Products—catalogue issued by the Canadian Rand Company, of Montreal, descriptive, with numerous illustrations, of their various kinds of industrial machinery with special application to construction and mining operations.

The St. Helens Cable & Rubber Co. Ltd.—Electrical catalogue advertising their cables, wires, rubber goods, etc. Head offices and works, Warrington.

Code No. 896 Compact Type Magneto Telephone—bulletin by the Stromberg-Carlson Telephone Company, Rochester, N.Y.

Clay Conduit—pamphlet issued by B. S. Barnard & Company, New York, manufacturers of clay material.

The First Engineers—Attractive calendar for 1911, issued by Allis-Chalmers-Bullock, Limited, Montreal.

Peerless Armature Tools and Car Barn Appliances—catalogue issued by the Electric Service Supplies Company, New York, describing their railway material and electrical supplies.

The Federalist—The monthly house organ of the Federal Electric Company, Chicago.

Detroit Fuse & Manufacturing Company.—A well illustrated catalogue issued by the Detroit Fuse & Manufacturing Company, Detroit, Mich., covering their line of "Detroit" Iron Clad Fuse Switches and "Arkless" Mechanical Indicating Enclosed Fuses. A number of new types of switches are illustrated, and the operation of the "Detroit" Switch is clearly shown by means of several photographs.

Catalogue of Wiring Devices, recently issued by the Bryant Electric Company, of Bridgeport, Conn. Distributed by the Canadian agents, the Northern Electric & Manufacturing Company, Limited.

Federal Sign System.

The Federal Electric Company, Chicago, Ill., has completed arrangements whereby the sale of goods manufactured by the company will be handled exclusiyely by the Federal Sign System (Electric) as selling agents. The latter corporation has main offices at 501 Home Insurance Building, Chicago, and 229-231 West 42nd Street, New York City, with branch offices in fourteen other large cities.

Education for Industrial Purposes

An exhaustive report on "Education for Industrial Purposes," has just been presented to the Ontario Government by Dr. John Seath, Superintendent of Education for that province. Dr. Seath's experience and operations in his lifelong connection with educational matters in Ontario render his conclusions exceedingly valuable. The inferiority of the artisan, the lack of intelligence shown in his work (which means lack of interest), and the absence of the faculty of improving himself beyond a certain low standard, are all factors having an important bearing on the excellence of the finished product of any factory or industry. Dr. Seath has worked out a fairly simple scheme of education by which these most needy individuals may be reached and has provided at the same time ample scope for the further improvement of the more ambitious. The report is lengthy, covering nearly 400 pages, and any review must necessarily be more or less disjointed. Without dealing with the many descriptions of industrial schools as they are found in other parts of the world we quote only, and very briefly, the recommendations of the superintendent, as follows:

"Having completed my survey of the existing provision in Ontario for industrial and technical education, I now submit the changes that appear to me to be necessary if we are to provide as adequately for the industries as we have long been providing for the professions.

"Of those boys and girls for whom industrial or technical training should be provided, there are two main classes:

1. Those who are in attendance at our public, separate, and high schools and who will enter an industrial occupation; and

2. Those who are engaged by day in industrial occupations and need this training, no matter what may have been their previous educational opportunities.

Of those pupils who are in attendance, there are two sub-classes:

a. The first sub-class consists of the very large number who leave school, for various reasons, at or before 14; and

b. The second sub-class consists of the comparatively small number intended for industrial occupations who remain or may be induced to remain at school for various periods after 14.

Leaving School at or Before 14

"Before the age of 14 the boy is not ready for industrial training, but he can be taught to use his hands properly making things in which he is interested; he may be trained so that his hand and his brain may work together; he may learn the value of accuracy and the result of miscalculation; he may also learn that nothing but good handiwork will do and nothing but the best is good; he may be taught to express himself with his pencil as well as in language, and in particular to make and to work from simple plans; he may increase his power of invention by designing objects in wood or metal; and, under the influence of a competent teacher and suitable environment, he may even realize that some forms are more beautiful than others. And the knowledge and skill he acquires by the above process he may turn into power in dealing with the handiwork of his future trade. If, in addition, the other subjects of the public school course are brought into closer relation to the pupil's life than they have hitherto been, they will become the best and, indeed, the only possible preparation for industrial work before the age of 14.

"For the girl who at 14 leaves school for some industrial occupation, the public school course to the end of the fourth form also needs to be modified. For the fourth form in particular, manual training should consist of household science and art work and drawing, the last named dealing chiefly with suitable freehand and elementary designing, and the rest of the course, as in the case of the boy, being intimately related to the life of the pupil.

Boys and Girls at School After 14

"As to the training of the important but, at present, comparatively small number of boys and girls who remain or may be induced to remain at school for various periods after 14. How to provide this training constitutes the chief educational problem of the day. With their compulsory attendance and their co-operative systems, Germany and Switzerland have made most advance. Great Britain and the United States are attempting a solution. In Ontario we are about to do so. As the result of my investigations and experience I have to report that, for this sub-class of boys and girls, three classes of day schools are feasible in Ontario:

"The General Industrial School.

"The Special Industrial School.

"The Technical High School and High School Department.

The General Industrial School (Boys).

"For this sub-class I propose General Industrial Schools, with a two years' course to be increased or diminshed according to local conditions. For such schools the curriculum should consist of shop work in wood and metal of a more or less general character, taking up about one-third of the time; with drawing, English, book-keeping, practical mathematics, and science, all intimately correlated with the shop work, and all being treated from the point of view of the workman and the industries of the locality. To this course should be added a general outline of English and Canadian History with special reference to the history of trade and commerce; as in European countries, suitable physical exercises to develop a symmetrical body; elementary civics and a course in English literature to broaden the mind and cultivate the finer emotions. The General Industrial School should be so organized as to provide a suitable foundation for whatever trade a boy might select.

The Special Industrial School (Boys).

"After the course in the general industrial school the boy should pass on to a special industrial school where the course is not general, but special; where the trades and similar occupations are taught with a view to making efficient workmen, and where the work is essentially individual and largely independent of machinery. Such a school, however, will not alone turn him out fully skilled. There he learns the theory and the processes of the trade. By applying this knowledge in the shop he becomes expert and develops speed. When about 16 the boy should receive in this school specialized instruction in the trades and other similar occupations, both practical and theoretical, with cognate subjects as well. Correlation with the local industries is especially to be desired., The number of years to be devoted to such instruction will, of course, depend upon the character of the trade and the necessities of the pupils.

The Technical High School (Boys).

"Some boys may, however, take a technical high school course. For such, separate schools may be provided or the courses may form a department of the high school, under competent direction. They would prepare for positions in industrial life which require special technical knowledge

and are of greater importance and responsibility than those held by skilled mechanics. Those who would attend them would come from homes unembarrassed by financial considerations, whereas with those who would enter the industrial schools wage-earning at an early age would be a necessity. The curriculum would provide for a two years' course taken by all, followed by elective two years' specialized courses, with, in both cases, direct applications of the principles of science and mathematics to practical work, such work having an industrial but not narrowly vocational character. The technical high school is a necessary function in a complete system of education; but for their products there would be little or no demand in Ontario for a good many years.

Girls at School After 14.

"Girls who enter any kind of industrial employment do so earlier than the boys who are to become skilled mechanics, and the courses that result in wage-earning capacity are by them more easily completed than are the corresponding courses for boys. We must, in the large majority of cases, provide an industrial course specialized from the beginning. In some localities the conditions might justify the establishment of a general industrial school with a one or two years' course before specialization. Such general courses might consist of English, geography, history, practical science, mathematics and drawing (freehand and designing). Suitable physical exercises should be provided. Secondary industrial schools are also desirable. More than one or two of such schools, we are, however, not likely to have in the near future. The establishment of a Faculty of Household Science in the University of Toronto will, under certain conditions, hasten the advent of such schools.

Schools for Workmen and Workwomen

"For the class of workers who cannot attend or who have not attended day industrial or technical classes, all the following are feasible for boys, and at least the evening school for girls:

"The Apprenticeship School.

"The Evening Industrial and Technical School.

"The Correspondence Industrial and Technical School.

The Apprenticeship School.

"The Apprenticeship School is a modification of the part-time co-operative school. In the latter the pupil, while attending school, goes to the factory for the supplementary practical work. In the apprenticeship school, on the other hand, the factory hand comes to the day school. In the absence of outside facilities apprenticeship schools have been established and maintained by railways and great manufacturing companies themselves. Besides foremen who devote themselves during shop hours to the instruction of apprentices, there are provided within the establishments during working hours or in the evenings classes in which are taught the theoretical parts of the trades, including drawing and such mathematics and science as are needed for intelligent workmanship. Conditions may not now be favorable to the general establishment in Ontario of such apprenticeship schools. One was established last September at the Dennis Wire and Iron Works in London, and there can be no doubt as to the efficiency of the system as seen in operation at the Grand Trunk Railway shops at Stratford. The apprenticeship school has the advantage over other part-time systems of being operated under actual business conditions and by expert instructors, who can at every step correlate the theory and the practice. It is altogether probable that, under suitable conditions, this type of school would be a partial and economical solution of the problem of providing skilled workmen.

The Industrial and Technical Evening School.

"The evening school has one great advantage over the day school. It overcomes the two main obstacles in the way of the day school—it does not interfere with the wage-earning of those who attend it; and it may be maintained at a comparatively small cost, for the equipment and accommodations used by day are available for it, and the part-time day teachers may be members of its staff. It has this serious disadvantage, that it is held when the mental capability of the pupil has been lessened by a day of toil. Moreover, the young workman does not realize the value of his opportunities, and sacrifices future gain for present pleasure. This disadvantage might, however, be overcome if, as some now do, the manufacturer required his apprentices to attend.

"The evening school must, for many years, be our chief reliance. After all, the devotion of five or six hours a week to directed and assisted evening study, which will increase their wage-earning power, is not so serious a tax upon the ambitious and healthy workman and workwoman. Nor should the educationist overlook the moral advantage of such useful occupation of the evening hours, especially to the adolescent.

The Correspondence School.

"I have found on enquiry a very general desire on the part of labor men that a correspondence school should be provided in Ontario. Even when we have secured a system of day and evening industrial and technical schools, many will not be able to avail themselves even of the evening classes. There will also be small manufacturing centres—too many, I fear—where it will be impossible to maintain evening classes effectively organized or evening classes at all. A school which would combine with class instruction by travelling teachers the best features of the Commercial Correspondence School appears to be a necessity in this province. The combination is, however, also a necessity; for, as is well known, few workmen succeed in getting an adequate return for their fees on the correspondence plan alone.

A Director of Technical and Industrial Education

"The history of this movement has shown clearly that, with the best intentions, but without competent direction, boards are liable to make serious economic and educational blunders. A few weeks' visit to schools of the character I am discussing will not enable the layman of the school board to settle problems which require technical knowledge, both expert and educational. The expenditure involved is too great and the interests at stake are too important to be left entirely to his discretion.

"I have, accordingly, to recommend, subject to the provisions of any general scheme, that each industrial centre shall be regarded as a separate unit for the purposes of organization; and that, as proposed later in this report, the industrial and technical school or schools for each such centre be organized by its board of trustees under the advice and with the approval of the Minister of Education. For this purpose, I recommend that this branch of the service shall be placed in charge of a departmental officer, whose duty it shall be to visit each manufacturing centre and formulate a plan of organization, after consultation with the school board and representatives of the local industries. This officer should have had technical training of a general character; and he should be an educationist in sympathy with the aims and methods of elementary industrial training.

A Provincial College for the More Skilled

"The lack of competent foremen and the higher grades of skilled workmen is now probably the greatest drawback to the progressive efficiency of our industries. If we are to have high-class workmen, "made in Ontario," we must pro-

vide high-class instruction. I would point out, also, the necessity for training the teachers of our manual training and industrial schools, and for establishing a correspondence-study school which shall combine with instruction by letter special class instruction by travelling teachers. I recommend, accordingly, that an Industrial and Technical College be established and maintained by the Provincial Government for the further training of the most progressive of our foremen and skilled workmen, for the training of the teachers of our industrial schools, and of pupils who have taken the courses at the special industrial schools, for the conduct of a modern correspondence-study school, and for such other purposes as may promote the interests of the industrial worker."

Dominion Institute for Industrial Research

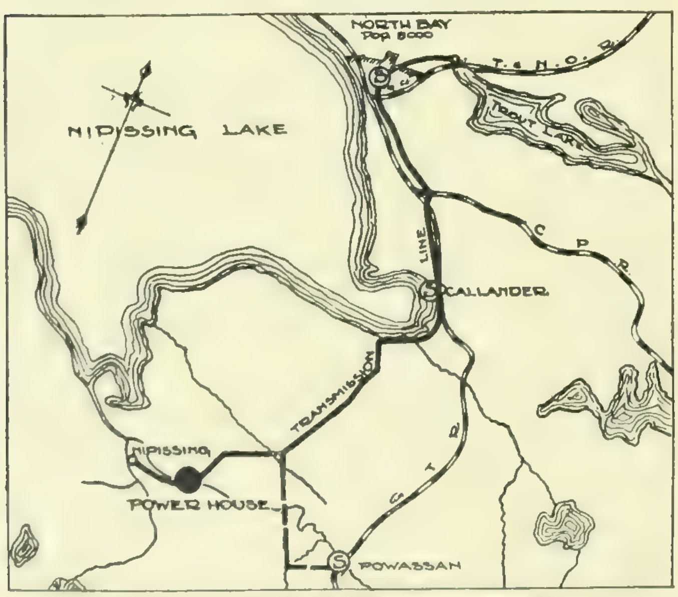
Under this heading Dr. Seath's report outlines important developments in the intimate relations which exist in various countries between the manufacturing establishments and the higher technical institutions which has done much, especially in Germany, to promote industrial emminence. In many instances the governments prosecute researches for the benefit of the manufacturers, often with the assistance of the latter, who place their staffs at the disposal of the scientists. The report instances, among others, the Imperial Institute of Physical-Technical Research, of Charlottenburg, which has for its object "the promotion by means of experiments, of scientific research and of precise technical work," and outlines the varoius types of research work being done along manufacturing lines in France, Switzerland, England and the United States. It is pointed out "that ignorance of the best means of utilizing our resources has prevented us from reaping the full advantages of their richness," and suggests that the Standards Branch of the Department of Inland Revenue, Ottawa, might be made the nucleus of an institute to carry on research work bearing upon all the trades of the Dominion.

Power Plant of Nipissing Power Co.

Located on South River—Water Piped Half a Mile—Power Carried at 22,000 Volts—Pumping Station for North Bay

During the last twelve months the town of North Bay has been receiving light and power from the Nipissing Power Company's installation on South River, some 20 miles from North Bay. The location of the power house and transmission lines is shown in the accompanying figure.

The water supply is obtained by tapping the South River, some 2,500 feet up-stream from the power house, and water is led first by an open canal 900 feet long and then by a 6-foot wood stave pipe 2,300 feet long to the power house. This pipe is tied every 6 inches with ⅞-inch iron hoops. Provision is made for a second and larger pipe to be installed in the near future. The storage pond above



Territory Served by Nipissing Power Co.

the diversion dam has a surface of about one hundred acres and is supplied by a drainage area of 350 square miles.

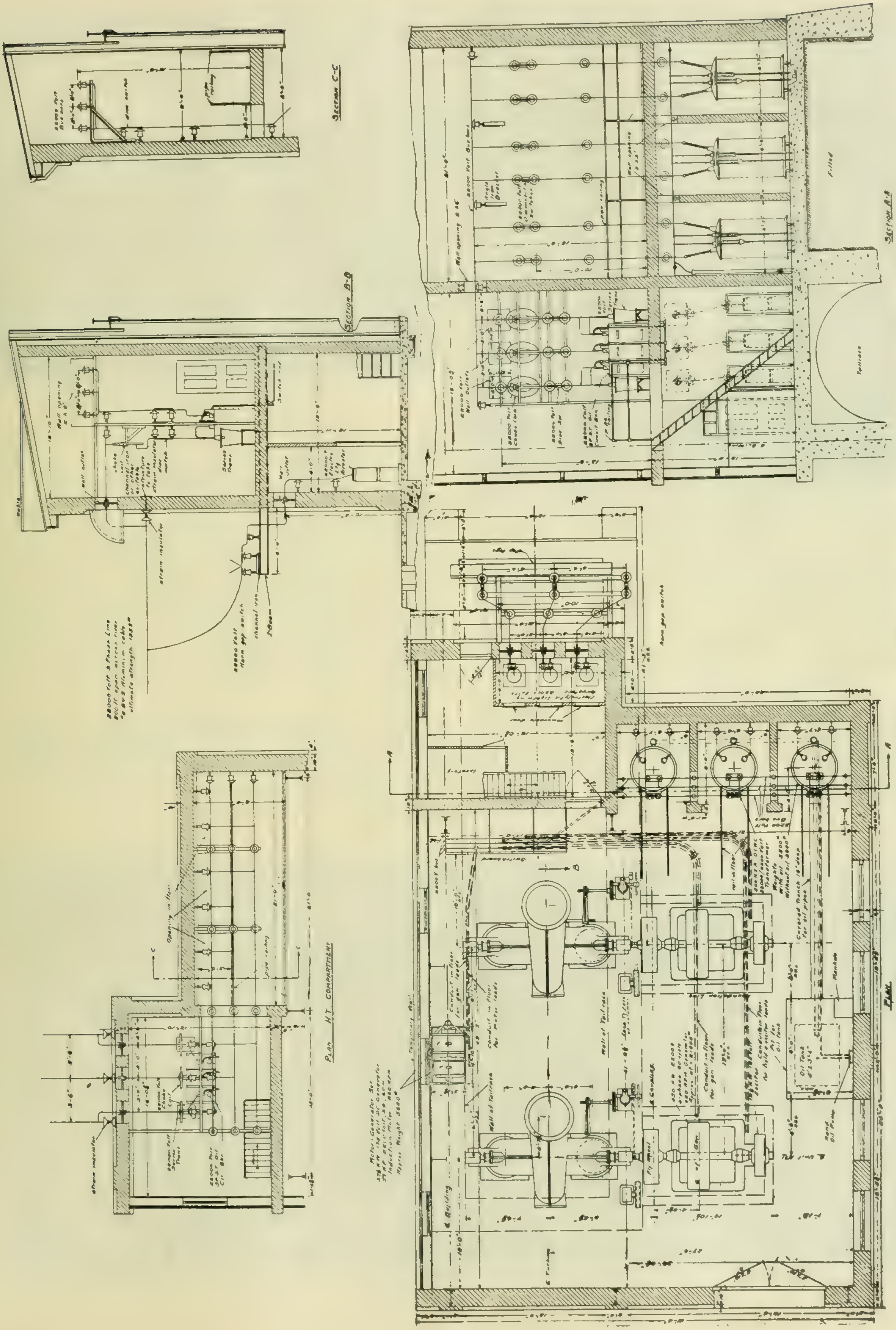
The present power house installation includes two 925 h.p. each, 450 r.p.m. Jenckes turbines, to operate under an 86 foot head, each turbine being supplied with a Lombard governor; these are direct connected to two 450 kw., 3-phase, 60 cycle, 2,200 volt generators with a 12½ kw. 125 volt direct connected exciter on the end of each generating shaft; a 37½ kw. induction motor-driven exciter set; three 300 kv.a. single phase oil insulated step-up transformers, 2,200 to 22,000 volts, delta connected. The plans provide for a further

Generating Station and Stand Pipe, South River.

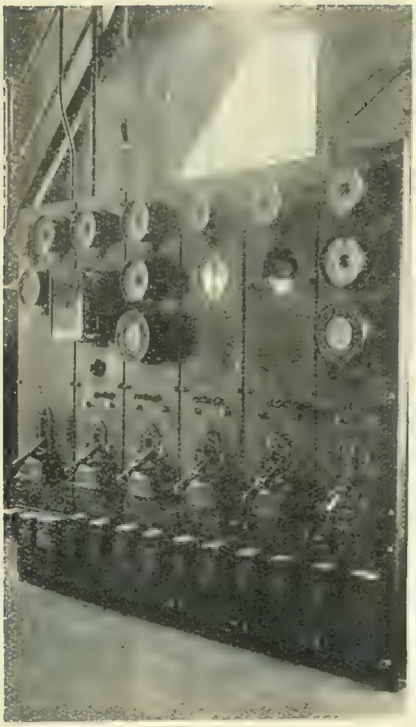
addition of another 450 kw. generator, a 900 kw. generator and corresponding transformers.

The transmission line, about 20 miles long, consists of aluminum cable carried on wooden poles. A steel cable running along the pole tops acts as a lightning protector and is grounded at every pole. A telephone line connecting the various parts of the system is carried by the same poles.

Power is supplied to the North Bay Light, Heat & Power Company, which distributes light and power through the town, and is now ready to operate a pumping outfit some three miles from the town; to the C. P. R. Co. for oper-



Nipissing Power Company, South River—Vertical and Horizontal Cross Sections of Power House and High Tension Compartments.

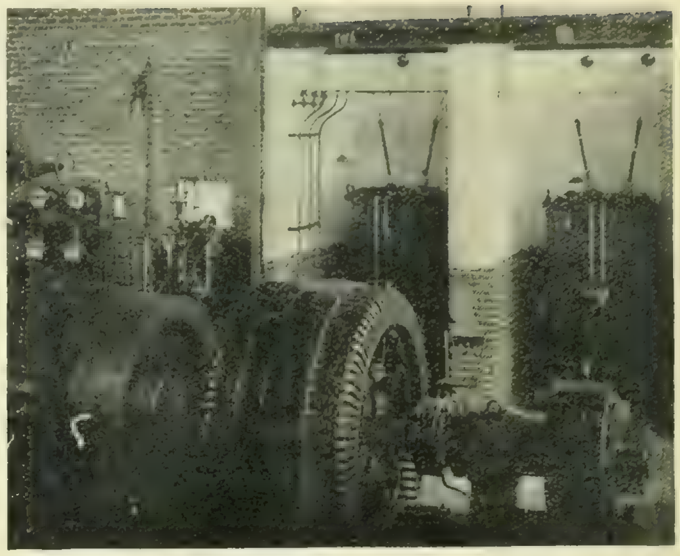



Switchboard, North Bay—Switches and Transformer, Callander.

ating their repair shops in North Bay; to Callander, where a small sub-station is situated, and to Nipissing village. Later it is proposed to transmit to Powassan and build a sub-station there.

The Generating Station.

The turbines are horizontal type, double discharge. In addition to control by Lombard governors a three-ton flywheel is installed on each shaft. The turbine shafts are both hand and governor controlled. The switchboard is Westinghouse manufacture. The usual protection of electrolytic lightning arresters and horngaps is installed, the latter being situated outside the building. The 22,000 volt lines after leaving the oil switches pass out through the side of the power-house, the exits being protected by a pro-



Generator, with Exciter on Same Shaft.

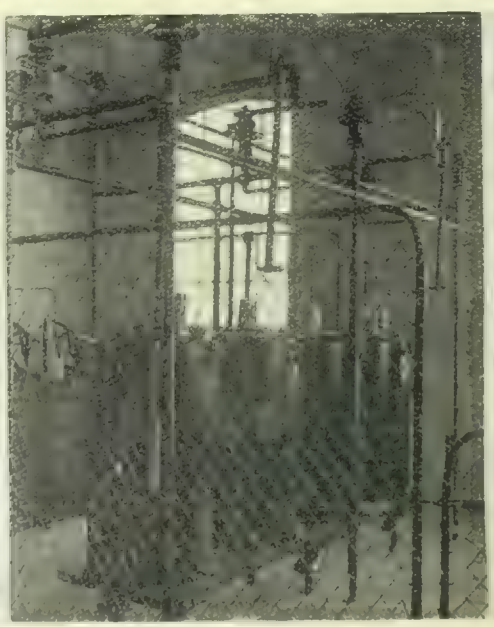
jecting hood. All the electrical equipment in the station is Canadian Westinghouse.

Callander.

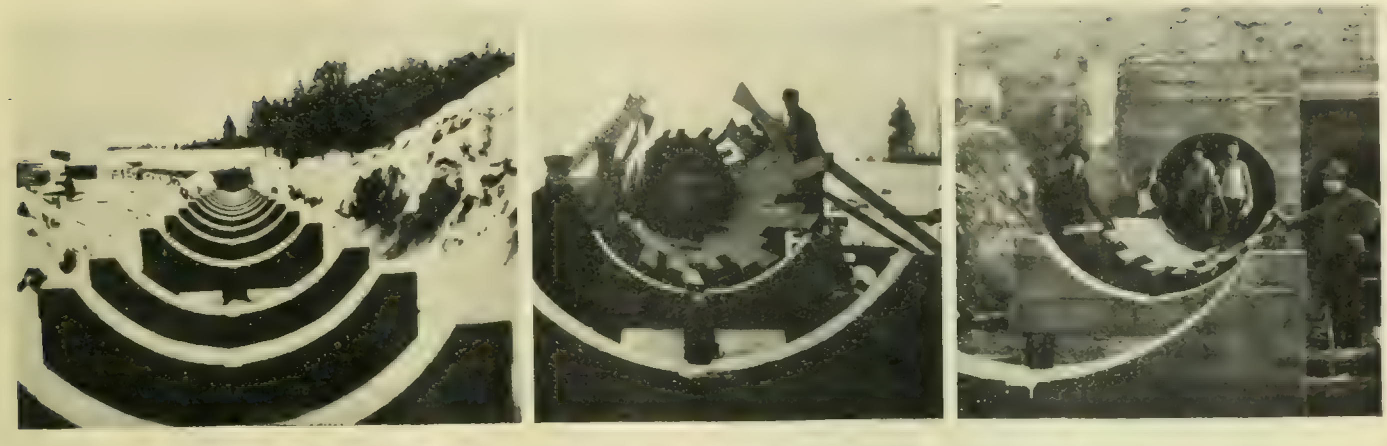
The main 22,000 volt line passes along the main street of this town, which is situated about mid-way between the generating plant and North Bay. A small transforming station is situated here for the supply of light and power. A view of the interior of this sub-station is shown in which may be seen the disconnecting switches and the high voltage lines leading down to the transformer. The high tension side is equipped with choke coils and expulsion type fuses. The low side carries hand operated oil switches. A single transformer of 50 kv.a. capacity has been sufficient to supply the demand to date.

North Bay.

The sub-station at North Bay contains three 450 kv.a. oil-insulated, self-cooled, single-phase step-down transformers, 22,000 to 2,200 volts. The sub-station is built in two stories. In the upper one the incoming 22,000 volt current passes through disc choke coils, disconnecting switches and oil switches before reaching the transformers in the room


Nipissing Power Company, North Bay Sub-station—High Tension Room and Transformers



Nipissing Power Company Construction Views of 2,300 Foot Wood-stave Pipe.

below. The upper storey also holds the protective spark gaps and electrolytic lightning arresters. As will be seen in the figures the high tension wires and apparatus is closed off by a protecting metal screen. All apparatus is Canadian Westinghouse. Distribution throughout the town was formerly single-phase, but has recently been changed over to three-phase. A motor driven turbine pump for supplying North Bay with water has just been installed some three miles from the town, at the head of Trout Lake. The apparatus at the pumping station consists of a C. G. E. 150 h.p. motor operating a Canada Foundry turbine pump. Power for this station is transmitted at 2,200 volts from the North Bay sub-station.

Another good customer of the Nipissing Power Company is the Canadian Pacific Railway Company, which have extensive locomotive repair shops at North Bay. The company, in lighting and motor requirements, will use in the near future in the neighborhood of one hundred horse power.

Nipissing Village.

The requirements at this point are not yet very heavy and a 10 h.p. motor generator has been installed to care for the lighting requirements. A single-phase, 2,200 volt, transmission line connects this village with the main generating station, a distance of from two to three miles.

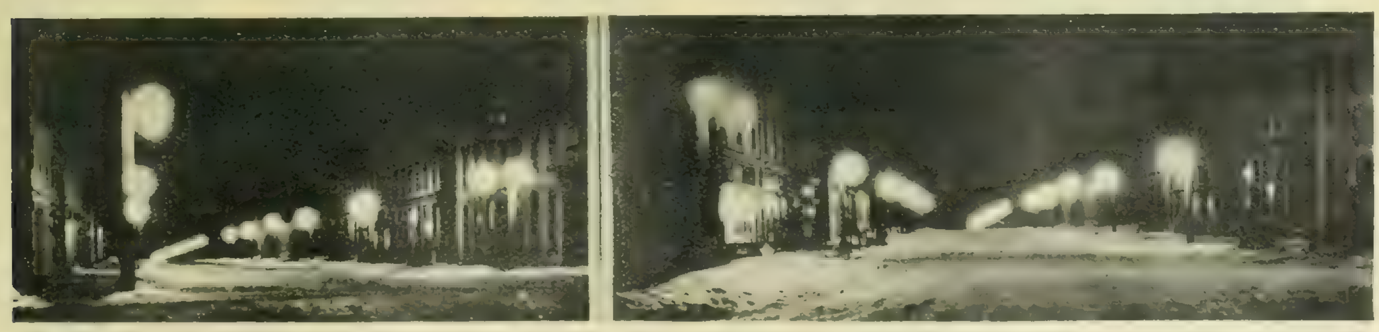
The Nipissing plant was installed by the engineering firm of Smith, Kerry & Chace, Toronto, and is now operated as a subsidiary of the Electric Power Company which controls large water power interests in the Trent Valley district. The manager of the company is Mr. Daniel Clark, of Powassan, and the superintending engineer, Mr. W. H. Mulligan. The past year's uninterrupted operation of this plant indicates the excellence of the supervision being exercised by both of these officers.

Illumination in New Hamburg Town

Current from Niagara Falls—A Neat Little Sub-station—Streets Well Lighted by Tungstens—Controlled by Relay Switches

No better example of the numerous revolutions being effected throughout Southwestern Ontario, by the arrival of the Niagara power, can be seen anywhere than in the progressive little town of New Hamburg, in Waterloo County. A badly disabled, overloaded steam generating plant has been replaced by a compact, scrupulously clean and amply powerful transforming station. A few odd carbon incandescents and a few worn-out street arcs, situated on the principal corners only, rather intensifying, by comparison, the long dark stretches between, have given way to a judiciously distributed, modern installation of 60-watt tungstens: and the dim, blackened, years-old carbon lamps of the stores and houses, their inefficiency magnified by a voltage often running below par, now vie with the street lamps in turning this bright little town by day into a brighter one by night.

The energy is obtained from Berlin, some 14 miles distant, where one of the main sub-stations of the Hydro-Electric Commission is situated. Current is led in by a double circuit, wooden pole line, the double line being considered a necessary precaution, by the commission's engineers, for the supply of a continuous service; it also allows for large



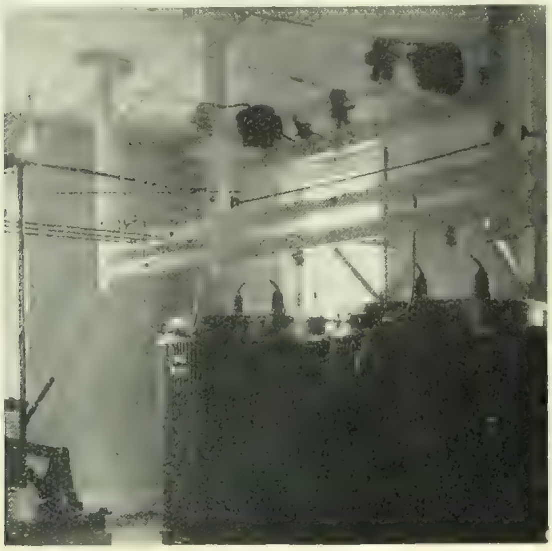
Niagara Power in New Hamburg Town—Streets Lighted by Tungstens.

future expansion. From Berlin to New Hamburg the voltage is 13,200; the transmission wires are stranded aluminum, about 107,000 circular mils cross section.

The New Hamburg Station.

All high tension wires inside this sub-station are solid aluminum ⅜-in. diam.

The usual lightning protection of horngaps and electro-



Wooden Rack, Supporting High Tension Wires

lytic arresters is installed within the station just below the line entrances. The main lines also carry choke-coils. The current then passes through oil-switches to three single-phase, 75 kw. transformers; these are delta connected on both sides. Before reaching the main transformers the main lines energize two small transformers which operate an overload relay for opening the oil-switches in case of line surges, short circuits, etc. The switchboard is a three-panel blue Vermont marble type, supplied with ammeters, voltmeters, power factor meter, integrating wattmeter and a recording wattmeter. Four three-wire, 2,200 volt distributing lines pass out of the station to serve different sections of the town with light and power.

The accompanying photographs will give a fair idea

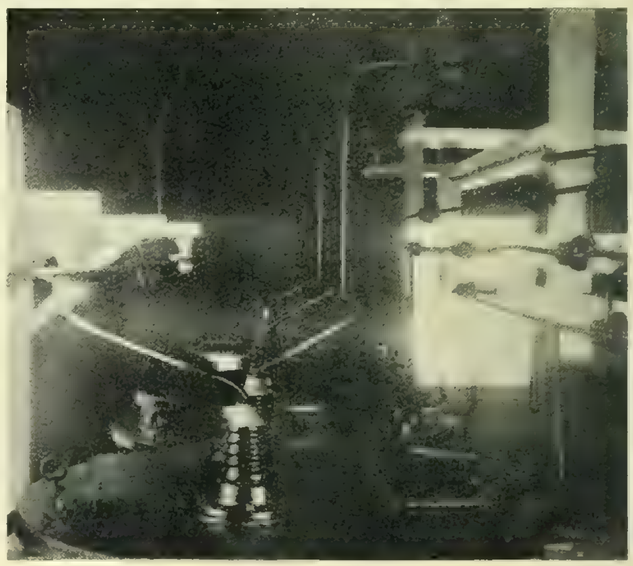
Choke Coils and Lightning Arresters.

of the arrangement of the apparatus in the sub-station. Compactness and neat construction obtain to a marked degree. The transformers are Packard manufacture; the arresters, oil-switches, switchboard and auxiliary apparatus are Westinghouse.

The Street Lighting.

Tungsten lamps only, are used on the streets, 60-watt size. The mode of suspension is somewhat unusual, as may be seen from the photographs shown herewith. The brackets are placed at an angle of 15 degrees to and above the horizontal, so that the lamp points out at an angle of 15 degrees to the vertical, giving the roadway the advantage of this extra illumination. The reflectors used are slightly convex so that the sidewalks are properly cared for. Along the more outlying streets of the town these lamps are placed on one side of the street only and about 200 feet apart; one the main thoroughfare they are 100 feet apart, and in the central portion of the town and around the main corner, two lamps are placed on each pole and the poles are only 80 feet apart and along both sides of the street. Where two lamps are placed on one pole, each is suspended by a separate bracket inclined to the horizontal as already explained; the two brackets are also inclined to one another at an angle of 120 degrees, each being at an angle of 30 degrees to the sidewalk.

The effect of this arrangement of distribution is an unusually even illumination of the whole street, from one side to the other, where the double lamps are in use, while the



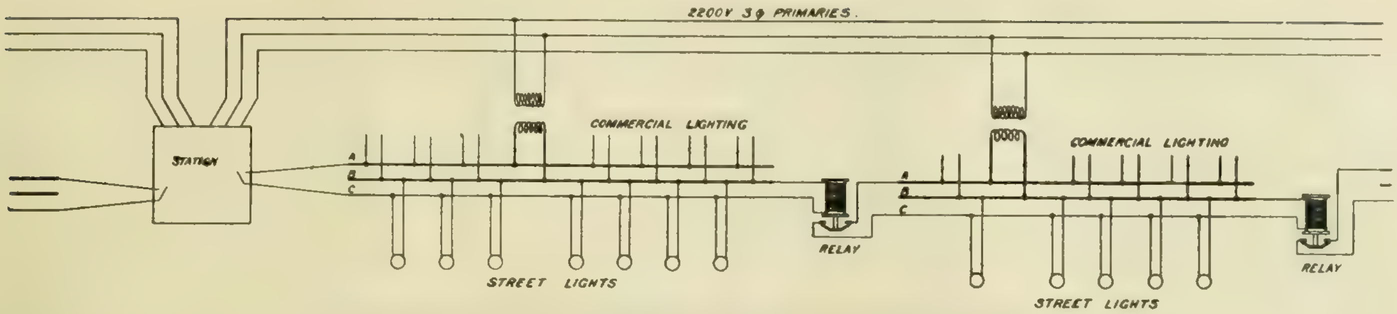
The Transformers are Delta Connected.

single lamp is ample and is being pronounced highly satisfactory for the residential sections.

Street Lights Controlled by Relay Switches.

The plan of operating the residential and street lighting system is somewhat unique and is shown in the accompanying diagram. Current is distributed for lighting by two 3-wire lines, 2,200 volts, to the service transformers in different parts of the town. To avoid duplication of service wires the residential and street lights are arranged as shown, on the secondary side of the service transformers. By this arrangement the lines A and B, which feed into the residences, stores, etc., are always in service, but the line C is controlled by a switch in the sub-station, and is either in service in series with A, or cut out entirely, according as the street lights are required or not. This third wire, C, is run, of course, in sections, one section to each transformer.

The diagram indicates also the method of operating these consecutive sections. The lines B and C of (say) the first section are joined through an electromagnet carrying a soft iron core moveable against gravity. The terminals of the lines A and C of the second section are brought to such positions that the circuit in them is completed when the magnet is drawn up, i.e., when the closing of the sec-



New Hamburg—Street Lights are Controlled by Relay Switches.

ondary switch in the power house energizes the line C of the first section. The closing of the circuit in section two operates the next relay, which in turn closes the third circuit, and so on. The action of the relays is practically instantaneous and during the three or four weeks they have been in operation have given every indication of permanent reliability.

House Lighting.

The old carbon lamps are being rapidly replaced with tungstens. Meters have never been used to any extent in New Hamburg, a flat rate being considered more satisfactory. This system will still prevail, but it will be kept under control by the installation of what is known as "maximum demand limiters," which the customer will purchase from the municipality at cost. This limiter allows a certain predetermined current to pass through without interference, but if this fixed amount is exceeded the limiter operates in such a way as to render the service intermittent and useless. The customer will be charged for the full amount of his demand limiter, so that he is free to use this amount day and night. As, however, the customer will supply his own lamps, the waste of current on this account is not expected to be great, especially as the higher priced tungsten

Type of Lamp Arms used in New Hamburg.

lamp will be very largely used. The rate is 75 cents per 100 watts per month, with a 10 per cent. cash discount. This plan is well adapted to encourage the use of household appliances, as if these can be operated without exceeding the demand at a time of day when lights are not in use, no extra cost is entailed

Power Distribution to Farmers.

A number of progressive farmers are already negotiating with this municipality for current to light their houses and barns and to operate small motors. It is believed this service can be provided at much lower operating cost than internal combustion engines, and the initial expenditure would not differ much in the two cases, everything considered. From the point of view of lighting alone the Niagara current would be many times more satisfactory. In one section there are about half a dozen farmers whose supply would require less than two miles of service wire, and it is expected the installation will be made here first. No large power contracts within the town limits have yet been closed, but when the continuity of the service has been satisfactorily shown, there are a number of factories and a large modern milling establishment that will all need considerable blocks of power.

The design and construction of the New Hamburg system has been carried out under the direction of Mr. E. B. Merrill, consulting engineer, Toronto. Mr. George Thomas had the contract for construction and has completed it in a thoroughly satisfactory manner. The management of the system is in the hands of a board of commissioners, of which the Reeve, Mr. J. F. Katzenmeier has been chairman since the inception of the work. Much of the credit for the installation is due Mr. Katzenmeier on account of his untiring interest in the work and his determination to have the best the town could afford.

The town is also fortunate in having been able to retain Mr. Geo. Morley as superintendent. Mr. Morley is a son of the owner of the plant before it was taken over by the town, and in his capacity as superintendent then, gained experience in both an operating and business capacity which is now proving valuable to the municipality.

The city of Edmonton has applied to the Canadian government for power rights on the Grand Rapids of the Athabasca river. The plans filed with the application show a maximum power, if all dams are built, of 60,000 horse power. The city does not require all of this power, and hopes to interest the provincial government, so that a power distribution scheme similar to that of the Hydor-Electric Power Commission of Ontario will be adopted.

A bill has been introduced by Mr. S. Charters, amending sec. 15 of "The Local Municipal Telephone Act of 1908," by substituting "The Ontario Railway and Municipal Board" for "the Lieutenant-Governor in Council." The Act also is amended by adding another section dealing with the placing of any telephone system under the supervision of a Board of three Commissioners.

Canada purchased from the United States in the eight months ended November 30, 1910, electric insulators and batteries and telephone and telegraph instruments valued at $2,417,569, and only $53,209 from all other countries.

Cost of Industrial Power

At the January meeting of the Toronto Section of the A. I. E. E., an interesting paper was read by Mr. Aldis E. Hibner on the subject "The Cost of Industrial Power." The paper discussed the cost of power to the manufacturer who instals his own power plant and showed that, except in rare cases, when all legitimate expenses are considered the cost of power privately generated is higher than the price at which it can be purchased in the open market. Mr. Hibner said in part:

The cost of producing power by large central station plants has been fully discussed by the Institute, but, while some of the principles involved are the same, there can be no direct application to the small industrial plants. In the one case we are dealing with stations of several thousand horsepower capacity, in the latter with a plant of a few hundred. The central station is organized for the manufacture of electric power and the plant location is chosen with the object of producing power at the lowest possible cost. The industrial plant is organized for the manufacture of shoes, or what not, and other considerations are more important in its location. The former has every possible advantage in favor of cheap power, the latter very often everything against cheap power. There are other considerations which make the problem quite different, such as the use of steam for heating and industrial processes. It is not at the present time, as formerly, a question of electric drive versus mechanical drive, for nearly all the new private plants are electric. What the manufacturer wants to know is, "shall I purchase my power from a power company, or are my conditions such that I can produce it cheaper myself?" It is some of the factors entering into a solution of this question that I wish to discuss in this paper. Every factory has conditions peculiar to itself which require special attention and prevent any general deductions. This does not mean, however, that the solution of a typical case will not be of value in showing the relative importance of the different factors.

There are in general three factors involved in every industrial power problem, the investment charges, operating charges and the cost of heating. The investment charges are understood to cover the interest, amortization, insurance, taxes and profit on the capital invested in the plant. The operating charges include coal, labor, repairs, and supplies. The cost of heating is the investment and operating charges of the boiler plant necessary for heating and building and supplying steam for manufacturing processes.

A typical example of the conditions ordinarily found, we will say, is the Brown Shoe Company, which has outgrown its present quarters and has decided to build a new factory and eventually double its output. The building is to be of brick, four stories high, two hundred and fifty feet long and sixty feet in width. This gives a total of sixty thousand square feet of floor area and a content of 750,000 cubic feet.

Now one of the first things which must be determined before starting construction is whether power will be purchased or supplied from a private plant. The first step in the solution of this problem is to determine the cost of heating the building. A heating plant is necessary in any case, as the conditions of manufacture are such that the temperature of the building must be kept above fifty degrees during the winter months. The following figures may be taken as typical:

Investment—	
Engine and producer (A)	$11,900.00
Generator, switchboard, wiring (B)	2,500.00
Building (C)	2,500.00
	$16,900.00
Fixed Cost—	
Interest, 6 per cent. on $16,900	$1,014.00
Profit, 5 per cent. on $16,900	845.00
Insurance and taxes, 2 per cent. on $16,900...	338.00
Amortization on (A), 15 year life, 4½ per cent.	535.00
Amortization on (B), 20 year life, 3 per cent. .	75.00
Amortization on (C), 50 year life, ½ per cent. .	12.50
	$2,819.50
Operating Cost—240,000 kw. Hours—	
Coal, 3 lbs. per kw. h. at $4.00, 360 tons ...	$1,440.00
Engineer at $18.00	936.00
Oil and waste	125.00
Repairs	300.00
Water	133.00
Emergency service	300.00
	$3,234.00
Total	$6,053.50
Cost per kilowatt hour	.025
Cost per horsepower per year	$56.20

The operating costs of the producer plant are only about one-half that of the steam plant. This, however, is counterbalanced by the cost of heating. The final result gives a slightly higher cost for the gas producer plant. The ratio of the fixed cost to operating cost in the two cases, however, produces a very marked effect where the load factor is poor. The only items affected by the output of the plant are coal and water. These represent only about 27 per cent. of the total cost as against 50 per cent. with the steam plant, the result being a very much higher cost for the gas producer at low load factors. The poor fuel economy on light loads would further exaggerate this effect.

I am very strongly of the opinion that manufacturers lose perspective in judging of the importance of the cost of power in comparison with other factors in their cost of production. It is rarely that the power cost represents more than 2 per cent. of the cost of the manufactured article. A saving as large as twenty-five per cent. in the cost of power then only reduces the total cost one-half per cent. Balance this against the item of labor, which often represents 50 per cent. of the cost of production. A saving of one per cent. in this factor accomplishes the same result as a twenty-five per cent. reduction in the cost of power. It seems to me that the chances of a one per cent. reduction in labor cost is greater than a 25 per cent. saving in power cost, when it is considered that a manufacturer is quite expert in labor matters and inexpert in power conditions.

Heating Plant Investment.

Boiler, piping and auxiliaries (A)	$1,500.00
Building and stack (B)	2,500.00
Total Investment	$4,000.00
Fixed Cost—	
Interest 6 per cent. on $4,000	$ 240.00
Insurance and taxes, 2 per cent. on $4,000	80.00
Amortization on (A), 4½ per cent., 15 year life.	67.50
Amortization on (B), ½ per cent. 50 year life .	12.50
	$400.00
Operating Cost	
Coal, 475 tons at $3.00	$1,425.00
Fireman at $15.00 per week	780.00
Supplies and repairs	100.00
	$2,305.00
Total cost	$2,705.00

Replacement of the plant has been provided for by a sinking fund drawing 6 per cent. interest compounded semi-annually, based on a life of the various parts of the plant as given in the table. The time of the fireman has been figured for the entire year, as steam at high pressure is required the entire year for industrial purposes. It is of interest to note that the cost of coal represents only a little over fifty per cent. of the total cost of heating, and that a variation of twenty-five per cent. in the amount of coal burned causes only thirteen per cent. variation in the total cost.

Having determined the expense which is absolutely necessary in connection with the power requirements, the question asked is whether it is advisable to go a step further and make the additional investment necessary for generating power, or whether it shall be purchased from a power company. The answer, obviously, depends upon the additional cost of producing this power and the rate at which power can be purchased. Having determined the former, the rate at which power can be purchased to advantage is fixed.

The concern under consideration has a maximum demand for power of 100 kilowatts (134 h.p.) The average load is 80 kilowatts (107 h.p.), giving an 80 per cent. ten hour load factor. The engine is a Corliss non-condensing, requiring thirty pounds of steam per indicated horsepower hour. The boiler evaporation is taken at seven pounds of water per pound of coal, giving a coal consumption of 4.3 lbs. per indicated horsepower hour. The efficiency from steam cylinder to switchboard is 78 per cent., giving a coal consumption of 7.39 lbs. per kw. h. (5.51 lbs. per h.p.h.) at the switchboard. The factory runs 300 days per year.

Complete Power Plant Investment.

Engine, generator, switchboard, wiring (A)	$5,500	
Boilers, steampiping, auxiliaries (B)	5,000	
Building, foundations, stack (C)	5,000	
		$15,500
Steam heating plant		4,000
Additional for power		$11,500
Fixed Cost of Power Plant—		
Interest, 6 per cent. on $15,500	930.00	
Profit, 5 per cent. on $11,500	575.00	
Insurance and taxes, 2 per cent. on $15,000	310.00	
Amortization on (A) 3% (20 year life)	165.00	
Amortization on (B) 4½% (15 year life)	225.00	
Amortization on (C) ½% (50 year life)	25.00	
		$2,230
Fixed cost on heating plant		400
Additional for power		$1,830
Operating Cost of Power Plant 240,000 kw. Hours—		
Coal at 7.39 lbs., 887 tons at $3.00	$2,661	
Banking, 181 tons at $3.00	543	
Night heating, 202 tons at $3.00	606	
Engineer at $18.00	936	
Fireman at $15.00	780	
Water	100	
Oil, waste supplies	150	
Repairs	200	
		$5,976
Operating cost of heating plant		2,305
Additional for power		$3,671
Total additional fixed and operating cost for power		$5,501
Cost per kilowatt hour		.0229
Cost per horsepower year		$51.40

Among the items of fixed cost will be found one covering a profit on the additional investment required for a power plant. It is quite clear, I believe, that a concern is not justified in investing in a power plant, unless the capital so invested returns the same profit as if invested in the most profitable part of the business still capable of extension. When the added risk is taken into consideration, I think this could safely be raised to ten or fifteen per cent.

There is nothing, I believe, among the items of operating cost that requires explanation, with the possible exception of the night heating. The engine is only running ten hours per day. It is evident then, that, unless live steam is supplied to the heating system during part of the remaining fourteen hours, the temperature will fall below that safely allowable. This feature is too often overlooked by the average power user. He thinks that if he installs an engine his heat will cost him nothing, forgetting that every night his watchman is turning live steam into the heating system for a length of time depending upon the temperature outside.

It is evident from these results that if power can be purchased for two and three-tenths cents per kw. h., there is no advantage in installing a steam power plant.

The Exhaust Steam Turbine.

It is interesting to note the effect of the use of exhaust steam on the cost of power.

If all the exhaust steam from this plant were available for industrial purposes, the only additional investment necessary to produce power is the $5,500 for an engine and generator. The fixed cost on this amount to 16 per cent., or $880 per year. The extra operating cost is an engineer at $936 and $250 to cover oil, waste and repairs, giving a total of $2,066 for generating 240,000 kilowatt hours, giving a net cost of .86 cents per kilowatt hour. It is quite evident from this that the amount of low pressure steam that can be utilized plays a very important part in the cost of power.

Gas Producers.

The most active competitor of the steam engine for power production is the gas producer plant. This type of plant, which has developed since 1900, has shown remarkable economy of coal consumption when handled by experienced operators. The United States Geological Survey Report on Gas Producer Plants shows that for an average of a great many tests the non-condensing steam plant requires 2.7 times as much coal per unit as the producer plant. Their results give a thermal efficiency at the switchboard of 4.86 per cent. for the steam plant and 13.5 per cent. for the producer plant. The maximum attainable efficiency is probably 10.3 per cent. for the steam plant and 21.5 per cent. for the gas producer under present conditions. In view of this known economy a great many producer plants have been installed in the last few years.

For the factory under consideration the conditions will require the installation of a 175 horsepower engine and producer, and in addition a heating plant for heating the building. As this heating plant is required in any event, the cost of heating is eliminated as a comparative factor in the problem. The investment, fixed costs, and operating costs of this plant are given below. The cost of the plant is some higher than the corresponding steam plant. The life of the plant is also horter. This gives a higher fixed cost than for the steam plant.

Mr. N. Simoneau has been elected president of the Electrical Association of the Province of Quebec.

Mr. H. J. Glaubitz has been appointed superintendent of the electrical and waterworks departments of the city of London.

Sign Illumination

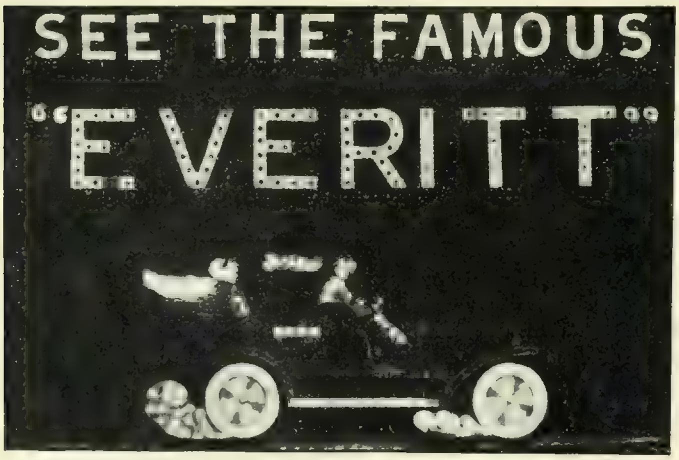
Electric Signs In Toronto

By Eugene Creed

Manufacturers and shopkeepers know that it is to their mutual advantage to advertise their wares. Why? Because to do so is profitable. Publicity pays. The merchant who has not advertised will be advertised by the sheriff, is an old saying.

It is not, now-a-days, whether one should advertise or not, the medium of publicity is the only question that agitates the minds of all up-to-date business men. The newspaper is good, the trade journal is better, the billboard has its merits, so has the circular letter, but, for local advertising, standing above them all, in a class by itself, telling its message twenty-four hours every day, is the Electric Sign.

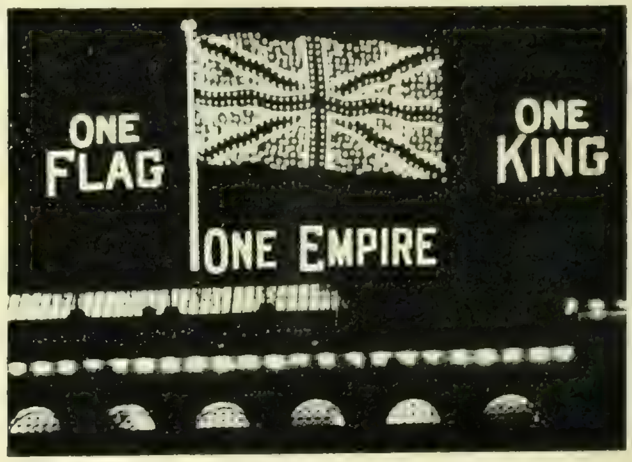
No city shows better than Toronto what electric publicity will do or can do. In less than two years the main



streets of the city have become the most brilliant of any on the North American Continent.

Yonge street is known as the "Great Bright Way." Signs flash out at every point, impressing upon the minds of the public the messages they have been built and illuminated to send abroad. They speak silently, but eloquently, the name of the product, place of amusement, shopkeeper, manufacturer or producer. Scintillating, flashing, brilliant fountains; twinkling stars; jumping rabbits; racing automobiles; crawling snakes; lightning flashes; smoking cigars, pipes and cigarettes; dancing Scots and illuminated teapots, burn graphically into the minds of the observer messages and impressions that cannot be eradicated. The electric sign has increased and is increasing the volume of business in the older districts, and augments and draws trade to the newer sections. Toronto seems to have gone electric mad—and glad.

The Red Rose Tea Company has erected an immense sign at the corner of Yonge and Front streets, typifying a teapot with the steam floating upwards and at intervals the liquid gurgles from the spout of the pot into a cup. The sign attracts a great deal of attention, for thousands of peo-



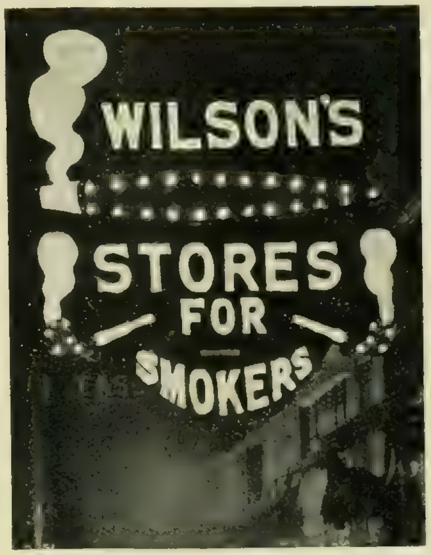
ple pass the corner nightly on their way from the boats to their homes.

One of the most novel electric signs ever erected in Canada has been hung on the facade of a building on Adelaide street west, for Fountain, the cleaner. The word "Fountain" is in eighteen-inch letters, running perpendicularly, while at the bottom are the words "The Cleaner," in sixteen-inch letters. Across the top are the words "My Valet." Over all is an immense electric fountain. This sign was built by Death & Watson, after the design was submitted to Mr. Fountain by one of the sign experts of the sales department of the Toronto Electric Light Company. The sign is attracting a great deal of attention, and for the amount of circulation secured is far cheaper than any other advertising medium that Mr. Fountain could employ.

On Bingham's sodawater sign the name "Bingham" is in eighteen-inch letters, running vertically, while a flowing stream from a sodawater tap fills a glass at the bottom of the sign. The whole is about fifty feet high and about four feet in width.

The Holman Electric Sign Company has installed for the Welsh Range Company a magnificent sign on Queen street west, while the Ontario Diamond Company and Williams, the optician, have erected immense signs that attract a great deal of new business.

Ryrie Brothers have removed their immense sign from



the corner of Shuter and Yonge streets and have put up a six-foot letter affair on the roof of their building at the corner of Yonge and Temperance streets.

The Salada Tea people have erected a four-foot electric sign at right angles to their building on Yonge street. They will retain their ten-foot letter sign, which overlooks the Bay, and is easily read by visiting Americans and others entering Toronto through the water gate.

Fairweather's sign on Yonge street is one of the most striking in the city. The firm's name is in twenty-four inch

letters, running perpendicularly, being surmounted by a burst of falling stars, which is lighted from a rocket.

The "Saturday Night" sign, located at the corner of Queen and Yonge streets, has attracted more attention than any electric sign that has been erected in the whole Dominion.

There is talk of a sign duplicating the Chariot Race sign in Detroit; in fact the roof has been rented for the proper display of this sign, and the builders are only waiting for permission from the city architect to report on the strength of the structure which is to bear the framework.

On the roof of one of the prominent buildings on Yonge street has been erected an immense racing automobile sign for the Tudhope Motor Car Company. This sign was operated during the Electrical Show and for a few days after, but will be replaced by an immense bottle and glass advertising O'Keefe's beer, the stream from the bottle will alternately fill and refill the glass.

The Imperial Tobacco Company have two immense signs on Yonge street, advertising their famous brand of cigarettes.

Applegath is known to every visitor to the city because he uses electricity for sign and outline work.

The most striking electric sign at the Exhibition last year was the one erected over the Toronto Electric Light Company's booth, reading "Electricity makes the Sad Iron a Glad Iron." An immense flat-iron burned constantly. The red border around the iron was given a snake effect, and the scroll work at the corners was in green lights with a waving flash.

The Toronto Electric Light Company sell electricity for advertising purposes to the merchants of Toronto, and guarantee circulation. Representatives of the company were stationed at different points in the city, where they counted the number of people passing these points between the hours of 5.30 and 9.30 p.m. The figures were shown to prospective advertisers and the results are to be seen by any promenader along Yonge, Queen, King, College, Bloor, Parliament, Roncesvalles, or any of the business streets of the city.

Wire and Cable Contracts.

The Wire & Cable Company of Montreal have recently concluded contracts with Western Canada governments and municipalities as follows: the cities of Saskatoon and Lethbridge, weather proof wire; Edmonton, rubber covered wire and lead covered telephone cable. The government of Alberta, Manitoba, and Saskatchewan have ordered quantities of lead covered telephone cable, rubber covered wire and bare copper line wire. The company's business in Eastern Canada is reported to be very satisfactory and promising.

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234. **Agents.**—A Birmingham firm manufacturing brass gas fittings and electrical accessories, chandeliers, brackets, etc., desires to get into communication with Canadian importers, and to appoint agents.

Notes on the Loading of Telephone Cable and Open Wire Circuits

By Samuel R. Parker.

The subject of loading, or inserting inductance, to improve transmission over long distance circuits, whether for telephone or telegraph work or for power transmission, is by no means new, Oliver Heaviside having gone into the subject theoretically in 1887. From that date, however, no practical steps of importance were taken to work out the theory of loading till M. I. Pupin in 1899 showed, from tests made, the feasibility of installing series inductance coils on working lines to improve their transmission. Although the subject of loading has come prominently to the front in recent years, information on it is very scattered. The object of these notes is to show why loading improves the transmission, and also some of the methods of calculation for obtaining the best results on various circuits.

The efficiency and limiting distance of speech of the telephonic circuit for long distance transmission depends on the magnitude and mutual relations of the following electrical quantities, namely—capacity, inductance, resistance, and leakage conductance. The essential difference between long and short distance transmission, is that on long lines the electrical speech impulses are transmitted in the form of electromagnetic waves, while on short lines the reflection of the impulse at the terminal instruments interferes with the advance of the wave crest, preventing these waves from forming.

As each sound transmitted over the telephonic circuit has a definite frequency, amplitude and wave form, it will be readily seen that the speech impulses take the form of a very complicated number of superposed vibrations or waves of different frequencies; these impulses as they progress along the line are subjected to two deteriorating influences, namely, attenuation and distortion. The quality of the speech transmitted depends on how the frequency or pitch, amplitude or volume and wave form or timbre of the sound—which affects the articulation—are reduced or changed by these two deteriorating influences.

The attenuation of the wave is a falling away of the amplitude due to a certain amount of energy being dissipated by the ohmic resistance I^2 R, by the shunting effect of leakage from the line and by the reaction from the inductive action upon surrounding bodies. Attentuation in itself is not harmful if not carried too far, as a receiver will convey an intelligible conversation when the amplitude is reduced to one per cent., if there is no distortion of the wave form.

Distortion is due to the capacity and inductance of the cable or wires affecting unequally the waves of different frequencies composing the speech impulse, thus altering the relative position and proportion of the subsidiary waves, which, in long distances, causes the wave form or special quality of the sound to be lost and the words to become indistinguishable, even though the volume of the sound may be large. Capacity causes retardation in the speed of transmission, causing a lead in phase; it also levels down the higher periodicities of the waves, so that in lines of high capacity the waves of high pitch may be wiped out altogether and only low pitched sounds transmitted correctly. Inductance may be represented as the inertia of the circuit; it tends to prevent any rapid change in the transmitted wave, and causes a lag in phase. Thus while capacity produces a lead in the resultant wave, inductance causes a lag.

The theory of loading being to so balance inductance and capacity in a circuit that they neutralize each other; the circuit in which inductance completely neutralizes capacity at all periodicities is distortionless, the speech impulses being only subject to attenuation; that is, in an ideal circuit of this kind, the speech wave at the receiving station would be an exact reproduction of the speech wave at the transmitting station, with a reduced amplitude depending on the distance between the two stations and the resistance and leakage conductance of the circuit. A complete balance between capacity and inductance for any one periodicity can be obtained when the resultant wave produced by capacity leads by the same current as that produced by inductance lags behind the impressed electromotive force. This will be readily seen, as the distorting effect due to capacity and inductance will have their maximum and zero values at the same points, but with opposite signs, that is, when the distorting capacity effect is at a positive maximum the distorting inductive effect will be at a negative maximum; and the impressed electromotive force for any one frequency will be in phase with the current, thus giving the best efficiency.

As capacity is evenly distributed along the line to neutralize it, inductance must be as evenly distributed as possible. To get the best results the inductance should be introduced into the circuit at certain short pre-determined intervals, depending on the wave length. From experimental tests it has been found that where the wave front passes from 7,000 to 13,000 coils per second very good results have been obtained. Pupin has worked out a mathematical formula by means of which he is enabled to determine the maximum distances which the added balancing coils joined in series to the line should be placed apart in order to approximate in efficiency to an equal uniformly distributed inductance.

The theoretically perfect loading coil should have the same effective resistance for all essential periodicities of the telephonic wave, to eliminate the distortion in the coil, but such a coil cannot be obtained in practice. The coil must have a certain inductance and must consist of several turns of wire and to reduce attenuation the resistance must be kept as low as possible. This can be most easily effected by introducing an iron core. If the coil is entirely of copper the effective resistance for frequencies within the range of telephonic periodicities will correspond to the loss due to eddy currents in the copper; if the core is of iron or other magnetic material additional losses will be introduced due to eddy currents in the core as well as hysteresis losses in the iron. As it is impossible to eliminate these losses the effective resistance will vary at different periodicities and produce distortion losses in the transmitted wave.

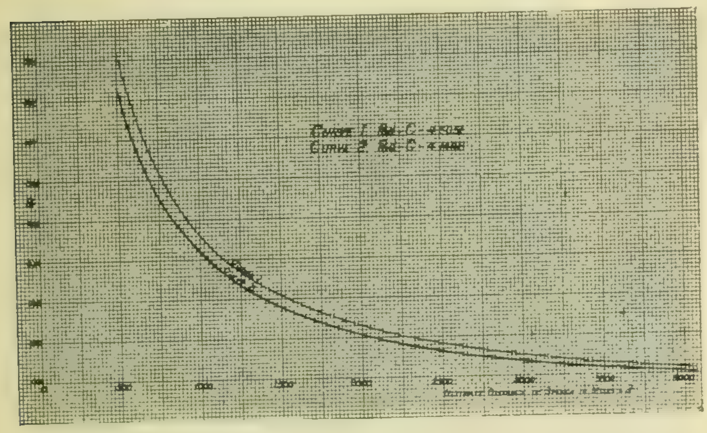
Practical and commercial reasons demand that an iron or other magnetic core be used, and as the tendency of the higher effective resistance of the iron cored coils is only to suppress and reduce the higher periodicities of the voice wave, which is found not to appreciably affect the quality or intelligibility of transmission, the advantage of a wholly copper coil is not markedly noticeable. The best coil to use is one that gives the required inductance with the largest time constant L/R, together with the smallest size.

In loading a line several considerations have to be borne in mind. The velocity with which electromagnetic waves are propagated over a line depends on the values of R, C and L. The greater the value of L the less the velocity, and the shorter the wave length for any one frequency of alternation. But when the wave length is small the number of coils for any given length will be large, as every wave length has to

be loaded with a certain number of coils to get the best efficiency, thus making the cost of loading prohibitive. For this reason when loading a line the greatest amount of attenuation to be allowed on a line, or the coefficient of attenuation, should be determined, and L calculated to give this attenuation, thus giving the greatest efficiency with the least added inductance, therefore the greatest wave length and the least number of coils.

Another point is that where the coils are not evenly spaced the efficiency of the line is reduced very appreciably, due to reflection between the coils. If l equals the distance between coils, the first and last coil on a loaded line should be placed ½l miles from each end, thus giving the line a tapered effect; this also keeps the spacing even if at any time it is desired to join two loaded lines in series.

One of the difficulties encountered on loaded lines is terminal loss, due to the reflection of the speech impulse at points of non-uniformity in the line, such as a point where a loaded aerial circuit is joined to a cable. It has been suggested that by tapering the coils this can be overcome, tapering meaning to reduce the inductance gradually at both ends of the line, keeping the spacing of the coils the same. Reflection also takes place at points where the instruments are bridged directly across a loaded line. It has been claimed that transmitting instruments for loaded lines should have a higher impedance than those for non-loaded circuits. The advantage of using apparatus of a higher impedance for loaded lines is most readily seen when considering the



Curve 1

transmitter end impedance of a very long overhead line. For unloaded lines this impedance is from 600 to 700 ohms, but for loaded lines, seeing that inductance has been added, this figure should be greater. The amount of inductance per mile necessary to completely balance capacity at a frequency of about 800 cycles per second on aerial wires is roughly 4.4 henrys, and that for cables about 0.5 henrys. From these figures it will be seen that for any given amount of added inductance the increased efficiency of the cable will be much greater than that of the aerial wires.

Some Methods of Calculation.

Coming now to a consideration of some of the methods of calculation for obtaining the best results on various circuits, the first point to be considered is, what frequency can be taken as representing the average for all speech waves?

In the discussion on a paper on "Loaded Telephone Lines in Practice," read before the Electrical Congress at St. Louis in 1904, by H. V. Hayes, it was shown that an underground telephone circuit when used for transmitting speech waves having frequencies ranging from 100 to 2,000 cycles per second, behaves, in regard to attenuation, as though it were operated at a single frequency of 800 cycles per second or an angular velocity of 5,025 radians per second. In an alternating current circuit the difference of potential Vd between the wires of a loop at d miles is equal to the difference of potential at the sending end Vo x e^{-Bd} and Vd lags behind Vo by an angle 'ad.' where the letters a and B are constants and

$a = \sqrt{[\frac{1}{2}\sqrt{\{(R^2 + p^2L^2)(S^2 + p^2C^2)\}} - \frac{1}{2}(RS - p^2CL)]}$

$B = \sqrt{[\frac{1}{2}\sqrt{\{(R^2 + p^2L^2)(S^2 + p^2C^2)\}} + \frac{1}{2}(RS - p^2CL)]}$

a being the velocity constant, B being the attenuation constant. (Oliver Heaviside's Electrical Papers, Vol. II.).

The meaning of all symbols used is as follows:

R—is the resistance per loop mile in ohms.
S—is the leakage conductance per loop mile in ohms.
C—is the mutual capacity per loop mile in farads.
L—is the inductance per loop mile in henrys.
p—is the angular velocity in radians per second.
e—is the base of the Naperian logarithms (2.718).
d—is the distance in miles.
l—is the distance between coils in miles.
a—is the velocity constant.
B—is the attenuation constant.
w—is the wave length in miles.
P—is ratio of circumference to diameter (3.1416).

As the expressions for the constants "a" and "B" are somewhat unwieldly it is proposed to simplify them as much as possible.

As the leakage conductance for aerial wires would not be more than 1.0 x $1/10^6$ and for cable not more than 1.0 x $1/10^7$, S can be neglected which reduces these constants to—

$a = \sqrt{[\frac{1}{2}pC\{\sqrt{(R^2 + p^2L^2)} + pL\}]}$ and . . . . . (1)

$B = \sqrt{[\frac{1}{2}pC\{\sqrt{(R^2 + p^2L^2)} - pL\}]}$ . . . . (1)

In aerial wires where the resistance is small compared to pL these will be simplified still further to

$a = p\sqrt{(CL)}$ . . . . (2)

$B = \frac{R}{2}\sqrt{(C/L)}$ . . . . (2)

In an unloaded cable where pL is small compared with R, a and B equal approx $\sqrt{(\frac{1}{2}pCR)}$ . . . . . (3)

(This result is, however, not correct to within 5%).

In a loaded cable pL cannot be neglected and equation (1) must be used for a and either (1) or (2) for B.

The attenuation factor is e^{-B}; from this the amplitude can be calculated at any distance; assuming the amplitude to be 1 to begin with, at d miles it will be e^{-Bd}

To find the balancing inductance for any circuit, by treating the speech wave as a simple alternating current having a frequency of 800 cycles per second, the angle A of lag due to inductance is such that tan A = pLI/RI = pL/R, the reactance being pL and the angle of lead due to capacity being such that tan A = —1/pCR, the reactance being —1/pC. Where inductance and capacity are both present, as in a telephonic circuit tan A = (pL — 1/pC)/R, the reactance being pL — 1/pC.

But as capacity and inductance produce opposite effects they neutralize each other when pL — 1/pC = 0 or when pL = 1/pC therefore L (the balancing inductance for any one periodicity) = $1/p^2C$. When this balance is set up the circuit is non-inductive and the current simply obeys Ohm's Law, that is, only attenuation takes place, the circuit being distortionless; but as the periodicity of a telephonic speech wave is not constant, it will be seen that under no conditions can a telephonic circuit be made absolutely distortionless.

Seeing that it is absolutely impossible to get a distortionless wave for all periods common to telephonic speech, these figures for L where it equals $1/p^2C$ can be taken as the limiting values for loading, the efficiency decreasing beyond this, the distorting effect being a purely inductive one.

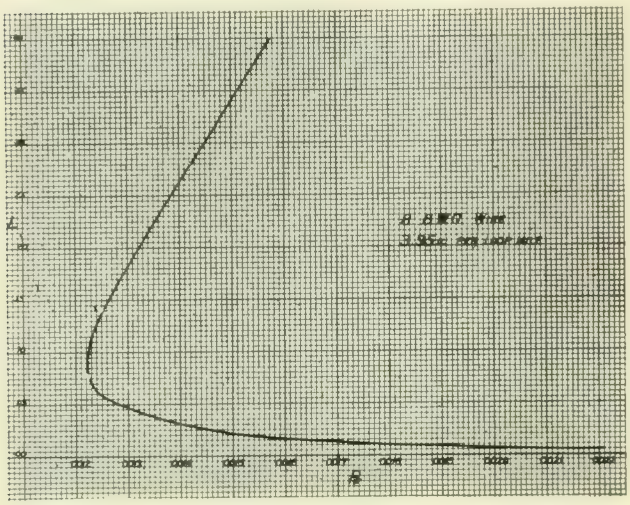
In telephone practice all that is required is a certain standard of transmission, there being no object in increasing the efficiency beyond that point. A definite standard of transmission is represented by a definite attenuation con-

stant B, (this does not take into account the articulation, merely the volume of sound transmitted)

An Illustration.

Taking an example To find the amount of inductance to be added so that the speaking efficiency of a No. 8 B. W. G. copper circuit at 1600 miles will equal the unloaded speaking efficiency at 1200 miles (limiting distance of speech approximately).

The attenuation constant for 1200 miles equals approxi-



Curve 2

mately $3.3 \times 1/10^3$; therefore the attenuation constant B necessary at 1600 miles to give the same speaking efficiency equals $3.3 \times 1200/1600 \times 10^3 = 2.84 \times 1/10^3$ and taking $B = R/2\sqrt{(C/L)} = .00284$; $L = (R + Rc)^2 \times C/4 \times .00284$ henrys per loop mile.

The amplitude at the distant end equals $e^{-Bl} = 1/e^{4.5} = 1/90 = 1.11\%$ of transmitting end amplitude.

From these figures it will be seen that Rc the apparent resistance of the coils greatly affects the value of B, and thus, although loading improves the articulation, it reduces the volume of the sound or the amplitude, and as the value Rc increases with the inductance of the coils, it will be readily seen that if a line is overloaded or loaded more than absolutely necessary to get the standard of transmission required, you are reducing the efficiency of the circuit instead of increasing it for long distance transmission, as if the amplitude is reduced too far, although the articulation is good, telephonically speaking, the circuit will be inefficient. When the value of Bd is such that $e^{-Bl} = 100$ or $Bd = 4.60511$ the limiting point at which loading is commercially of value has been reached. From this it will be easy to calculate the most economical value of B and thus the right amount of loading necessary to cut into a circuit of any given length to give the best efficiency

Best Spacing for Coils.

Considering now the best spacing for the coils; Professor Pupin has worked out a formula for the maximum spacing per wave length to give approximately the same efficiency as uniformly distributed inductance.

If the wave length be taken as a complete revolution = 360 degrees or in angular measure 2P and the length l, the fraction of a wave length between any two coils, given in angular measure = 2P l/w, then the nearness with which ½ sin 2P l/w approximates to ½2P l/w radians will represent the approximation of the efficiency of the loaded line to that of a line in which an inductance of equal value is spread uniformly over the line. When l/w = 0.1 then ½sin 2P l/w equals P l/w. So that the best efficiency is obtained when there are ten coils per wave length.

From experimental results it has been found that 7000/800 or 8.8 coils is the least that should be used per wave length, and that there is no advantage in putting in more than 13000/800 or 16.2 coils per wave length. These results agree with the above calculated result.

The only other formulae necessary are those for finding the inductance and capacity of aerial lines, those for cable always being known as they are manufactured to set standards. In this case for aerial lines L has been taken as equal to $0.1609 + 1.4821 \log_{10} (2h/d) \times 1/10^3$ henrys and C as equal to $0.0194\, lk / \log_{10} (2h/d) \times 1/10^6$ farads; 5% should be added to this result to allow for the reaction of the adjacent wires.

In these formulae

h equals distance apart of wires in inches.

d equals diameter of wires in inches.

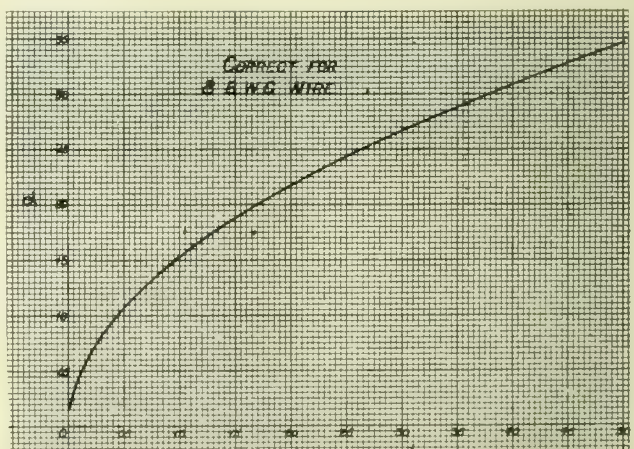
k equals specific inductive capacity of dielectric between conductors (for air equals 1).

l equals length in miles.

The only other point to be considered is the apparent resistance of the coils at different frequencies. As these coils are manufactured under patent very little reliable information is to be had regarding their characteristics. But it may be taken as correct that these coils are wound upon rings of magnetic material and have, practically speaking, no external field. Consequently they can be encased in metal and providing there is a thin iron shielding plate between them to provide against electrostatic and electromagnetic action may be packed on top of one another without any fear of induction between themselves or from other outside sources.

The best magnetic cored coils have a time constant of about 0.0240 (L/Rc) at 800 cycles per second, so that L being known the apparent resistance can be calculated.

Summarizing the above results it has been shown that



Curve 3

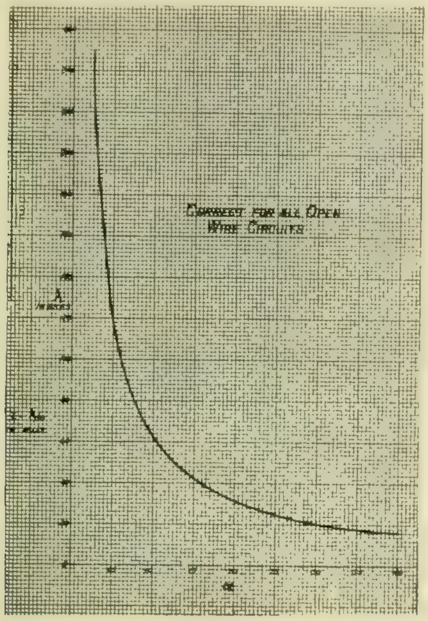
no matter how heavily a circuit may be loaded it is impossible to make it distortionless for all periodicities required in telephonic speech. This being the case the circuit will give the best efficiency when it is loaded just sufficiently to give the required transmission for the ultimate distance for which it is designed; to get this result if d equals this distance in miles, theoretically B should equal 4.60511/d but in practice this value of B has to be reduced approximately 10 per cent. to allow for extraordinary losses, such as leakage, eddy currents, and hysteresis losses, which exist on the circuit but which cannot be calculated This value for

B approximately very closely to the values calculated for the limiting distance of speech for metallic circuits of various gauges.

From equation (1) or (2) for B, the required value of B being known, L can be calculated.

The values of L. C, and R (resistance of mile of circuit plus apparent resistance of coils per mile) being now known, a can be calculated, using equation (1) for cable and equation (2) for aerial wires. From this we get the wave length and the distance between coils l equals 1/10 of the wave length.

The required inductance per loop mile being L, the inductance of each coil should be L/2 x l. If there are no coils having this inductance the coil with the next lowest inductance should be used, anad the distance l reduced so as to get the required added inductance per wave length. With this information before him the engineer will be in



Curve 4

a position to determine whether more economical results will be obtained by loading an existing circuit or installing a circuit of somewhat heavier gauge. It is of considerable importance that the insulation resistance of a loaded line should be kept good as the velocity being reduced the attenuation of the current due to leakage conductance will be considerably increased.

Curve 1 shows the different practical (B equals 4.1446/d) and theoretical (B equals 4.60511/d) calculated values for B as the ultimate distance of speech increases from 500 to 4,200 miles. This curve is applicable to all aerial circuits.

Curve 2 shows the amount of inductance required to give any definite value of B. This curve is plotted for an 8 B. W. G. circuit strung 12 inches apart. The critical point of this curve is reached when 0.10 henrys has been added per loop mile, and although theoretically 4.2 henrys should be added to get a resonant circuit at 800 cycles per second the added apparent resistance of the coils attenuates the current so much that the advantage gained in distinctness is lost in volume after the circuit has been loaded to 0.10 henrys per loop mile.

This curve only applies to an 8 B. W. G. circuit strung under the above conditions; for other circuits a similar curve should be plotted and the critical value determined

Curve 3 shows the value of a for any given amount of loading. This curve applies to an 8 B. W. G. circuit only.

Curve 4 shows the wave length and the distance between coils for any given value of a. This curve applies to all aerial circuits.

New $30,000 Exchange.

The new telephone exchange in North Vancouver, which the British Columbia Telephone Company has just erected at a cost of $30,000, was placed in operation on February 6th. The central energy system of operation is employed.

Automatic Telephones in England.

Consul Albert Halstead, of Birmingham, advises that exhaustive experiments are to be made by the general post office to discover whether the automatic telephone system can be effectively used in England. As a practical test the new buildings at Newgate street, London, are to be fitted with an automatic exchange. Should the device prove practicable, experiments on a large scale will be carried out which may possibly lead to the disappearance of the telephone girl

Yorkton Farmers to Install Telephones.

Farmers of Yorkton district have decided to organize a rural telephone system. Under the provisions of the government act the system will have twelve or more units capitalized at $1,000 each and will be the most up-to-date and extensive in the province. The farmers are already served with a rural system from Yorkton, but as it was not a standard and long distance connection was impossible it was decided to abandon this and build a new standard line

Dual Telephones in Whitby.

At a recent meeting of the Whitby council an agreement with the Markham & Pickering Telephone Company was approved, by which that company is given a five-year franchise to operate a telephone exchange in the town. The company is to pay $60 a year for the first three years, and afterwards give the free use of six telephones to the town. The agreement does not meet with favor from a large portion of the business community, who wanted the independent company and the Bell Telephone Company to effect a working connection of their lines so that Whitby would have communication with the country tributary to the town without the expense and bother of the second telephone. The effort to get the companies to come together was not successful, however, hence the franchise to the independent company.

Can't Compel Exchange of Telephones.

The Quebec Utilities Commission, Col. Hubbard, chairman, has held that the commission had not power to compel one telephone company to give the use of its lines to another and fix tolls. This discussion was in connection with the application of the People's Telephone Company to have the Canadian Telephone Company grant them the use of their lines. This agreement had been in force for fifteen years, but terminated in January, and the Bell Telephone Company entered into an agreement with the Canadian Company. The People's Company say they will apply to the Quebec legislature to extend the powers of the commission and that they will go before the railway commission again.

Following the unsatisfactory judgment of the Quebec Public Utilities Commission the People's Telephone Company appealed to the Dominion Railway Commission. This body has just rendered judgment in favor of the People's Company, ordering that the exclusive clause in the contract between the Bell Company and the Canadian Telephone Company by which the latter was prevented from connecting with the lines of the People's Company be omitted.

On nine of the largest railroads in North America there is already installed over 19,000 miles of telephone service for train despatching.

Current News and Notes

Alberni, B.C.

The Alberni Electric Light and Power Company, Limited, with head offices in Alberni, has been incorporated, and it is announced by the president, Dr. A. D. Morgan, that it will be in a position within two months from date, to install fixtures and supply electric light in every house in Alberni. Arrangements have been made for the purchase of a steam engine and boiler, and the electricity will thus be generated until such time as the demand for light and power becomes large enough to justify a much larger expenditure on the harnessing of water power somewhere in the district. W. W. G. Allister, secretary-treasurer; H. B. Mitchell, mechanical engineer.

Berlin, Ont.

There will be no extension of the Toronto Suburban Railway to Hamilton, Guelph, Berlin, Preston, Hespeler and Galt at present.

Bowmanville, Ont.

Work is progressing favorably on the sub-station being erected here by the Electric Power Company, of Campbellford.

Brandon, Man.

As a result of the report on the defective wiring in the hospital here, new wiring will be installed at a cost of about $700.

The Brandon Electric Light Company, Mr. George A. Paterson, manager, has offered to supply the city with 1,500 h.p. on a 30-year contract at $25 per h.p., delivery to commence December 1, 1911.

Brudenell, Ont.

At the last meeting of council a by-law was passed authorizing the Eganville and Brudenell Telephone Co. to erect and maintain a telephone line on the highways of the municipality.

Calgary, Alta.

During February the total earnings of the street railway system amounted to $19,280.35. Of this sum the net profit was $4,502.05.

The new steam power plant in Victoria Park was tried out early in March and worked to the satisfaction of Superintendent McCall.

The Natural Gas Company, Calgary, will lay piping from Gleichen, 55 miles distant, at an approximate cost of $3,500,000. Work will be started this spring.

The Alberta Electric Railway is seeking a charter at Ottawa. It is proposed to have Calgary as one of the terminals and the company is asking permission to enter the city.

General Superintendent Price, of the Canadian Pacific Railway, recently stated here, "there is little doubt that many sections of our lines, in the mountains at least, will be electrified within a few years."

The Calgary Power & Transmission Company are under contract with the city to deliver 4,000 horse power on April 1st or forfeit $50 a day. It is stated by a prominent shareholder of the company that the power plant will be ready.

Tenders for switchboard and apparatus for the new power station were received as follows: Canadian Fairbanks Co. (1) $4,804; (2) $6,053; Allis-Chalmers-Bullock, $5,200; Canadian General Electric, $5,700; Canadian Westinghouse Co. (1) $3,845; (2) $3,650 (accepted).

A proposal is said to have been made by the city to the Eau Claire Lumber Company looking to the purchase of the latter's electrical plant, which is a subsidiary company, operating under the name of the Calgary Water Power Company. The price mentioned is a million and a half dollars.

The report of Engineer Child on the low water development of the Elbow river, the site which both the city and the Western Calgary Power Company are trying to secure, indicate that scarcely more than 2,000 h.p. could be depended upon at all seasons. The city would not develop under these circumstances.

Cobalt, Ont.

The Northern Ontario Light and Power Company, which controls most of the water powers and electric distributing systems around here, has just purchased the Nipissing Central Railway, which connects Cobalt and Haileybury, a distance of between four and five miles. Mr. Beames has been appointed general manager of the railway.

Cobourg, Ont.

The citizens of Campbellford and Warkworth are agitating for the building of an electric railway through Northumberland county, now that it seems probable that the C. P. R. will build along the lake front, instead of winding through the county, as provided by the original charter. It is stated that the charter is secured and plenty of electric power available.

Edmonton, Alta.

Installation of meters on the street cars is planned by Commissioner Bouillon, and Superintendent Knight of the street railway department will look into the matter.

A motion has been passed by the city council to the effect that no contracts for machinery be passed until they have been referred to a competent engineer to be appointed by the council.

Fort Frances, Ont.

Nelson & Cassaday were awarded the contract to supply electric light poles for the town lighting system. The price to be paid is $1.75 per pole for 30 ft. 6 in. top and $3.25 per pole for 35 ft. 7 in. top.

Fort Saskatchewan.

The electric plant and sub-station showed a balance on hand at December 31, 1910, of $23,957.64.

Fort William, Ont.

The directors of the Kaministiquia Power Company have voted to spend $250,000 this summer for enlarging the power plant. R. S. Kelsch, construction engineer.

The Kaministiquia Power Co., Ltd., will require about 60 miles of standard copper wire shortly, for which contracts will be let. R. S. Kelsch, Power Building, Montreal, designing engineer.

Mr. R. S. Kelsch, consulting engineer, Montreal, has been engaged in making preliminary surveys with a view to establishing a definite plan for street railway extensions toward which the council will build as the growth of the city warrants.

A number of pay-as-you-enter cars were installed on the street railway here on March 1. The change was widely advertised in different languages so that as little confusion as possible would result.

Guelph, Ont.

Manager Hackney, Guelph Radial Railway, was authorized to secure specifications and call for tenders for construction of the St. Patrick's Ward extension.

Halifax, N.S.

The richest tungsten mine in the world is said to be located at Scheelite, near Moose river, Guysboro county, Nova Scotia.

Lennoxville, Que.

The Lennoxville Power and Light Company has been given permission to erect lines in the streets for the purpose of distributing electric current for lighting and power purposes for a period of ten years, on the same conditions as other electric companies doing business in the municipality.

Lethbridge, Alta.

The council is preparing to submit a by-law to the people to pave and lay street car rails on certain streets this year. If the by-law goes through tenders will also be called for new equipment for power house extensions.

The report of Superintendent Reid on line extensions, new street lamps and power house equipment ($1,600) was adopted by council. The estimated cost is as follows: Poles and wire extensions, $8,625; transformers, $3,000; meters, $5,000; 60 new street lamps and mast arms, $7,240; two wattmeters, water meters, frequency meters, $1,025; boiler gauge glasses, $110; total, $25,000.

London, Ont.

The London Street Railway has started the reconstruction of the Dundas street pavement.

The water commissioners will install red lights at Richmond and King streets, and at Clarence and Dundas streets to protect the fire department. City power will be used and a switch will connect with the central station. Whenever an alarm is sent in the red lights will be turned on, warning street cars as well as pedestrians that the brigade is coming.

The London Electric Company are stringing lines to the north and east of the city to supply power and light to customers living outside the city limits. Mr. W. W. Gammage and other customers there have been approached and offered light at 4½ cents a kilowatt. The water commissioners are charging 7

cents net to those residing outside the city limits. The company have signed up a large number, it is said.

Magog, Que.
The result of voting on the by-law giving the council authority to erect a larger power dam on the Magog river carried by a majority of 147 to 1. The council now have a very busy season before them in calling for tenders and in looking after the numerous details involving as it does an outlay of $110,000, and possibly $125,000. The Dominion Textile Company will give the town $12,000 per annum for all the excess power after taking all its lighting and power needs and 100 h.p. besides. This gives the town a definite revenue on which to calculate the financial part of the scheme.

Meaford, Ont.
The People's Railway Company will submit a proposition to this town with a view to extending their proposed railway system to this point.

Minnedosa, Man.
The annual meeting of the Minnedosa Power Company showed that good progress had been made in securing stock subscriptions, the total amount of stock taken locally being $53,100, but that at least $20,000 additional stock would be required to complete the work. All the machinery required has been ordered and will be delivered early in the season. The president reported that from the number of inquiries received there would be no trouble in selling the maximum amount of power produced. Mr. P. J. McDermott was elected president, J. F. Rea vice-president, and H. F. Maulton secretary of the company.

Moncton, N.B.
According to the engineers, Messrs. Mitchell and Ritchie, natural gas will be installed and ready for delivery by July 1, and part of the tramway system by September 1.

The plans submitted showing route of street railway, plans of construction and a complete system in connection with natural gas installation were approved by council. Engineer Mitchell is in charge. The work will mean thirty miles of pipe-laying.

Montreal, Que.
Action has been taken by the Board of Control to hold the Montreal Light, Heat and Power Company responsible for all damages accruing as a result of the gas explosions, which for some time past have been occurring on Sherbrooke street, between St. Lawrence and St. Denis streets. No fewer than five such claims have been filed.

Moose Jaw, Sask.
Tenders are called until April 1st for erection of car barns and power house for the Moose Jaw Electric Street Railway Co., Ltd. Plans, etc., at office of R. G. Bunyard, architect, Bank of Commerce.

Nelson, B.C.
The city council of Spokane has caused a survey to be made of water powers within a reasonable distance of their city. The report favors a power site on the Pend d'Oreille river, about three miles from the mouth of the Salmon river, owned at present by the Pacific Exploration Company. 30,000 h.p. is available. The distance from Spokane is 150 miles.

Ottawa, Ont.
A company is being organized to develop power at Carillon and Point Fortune on the Ottawa river under a lease granted to C. Ross, of Ottawa, about three years ago.

It is understood that engineers will be sent by the Hydro-Electric Commission to make a survey of various water powers around Ottawa with a view to recommending one of them for purchase by the city of Ottawa.

Tenders addressed to the chairman of the municipal electrical department, will be received until April 6th for supply of meters, transformers, incandescent lamps, arc lamp globes, carbons, hardware and sundry supplies. J. E. Brown, electrical superintendent.

The Municipal Electric Commission has passed the following resolution:

"That the commission recommend to council that as the city will require a further supply of power, the Hydro-Electric Power Commission be requested to enquire into and report upon the best available source of supply, either in Ontario or Quebec."

The Department of Public Works will issue a call for tenders for the construction of the dam at the foot of Quinze Lake, about 18 miles from head of Lake Temiskaming, the estimated cost of which is $59,000. Tenders will also be called this spring for the new dam at the head of Gordon Creek, which it is expected can be rebuilt from the present Lumsden estate dam, for a cost of about $5,000.

Penticton, B.C.
This town will install a small water power. As soon as the snow is off the ground surveys will be made. There will be about five miles of concrete conduit, the pressure pipe being under a static head of about 2,100 feet. 200 kilowatts will be installed at first, probably in two units.

Port Arthur, Ont.
The pay-as-you-enter system is adding considerably to the revenue of the two cities. Secretary Wilson states that the receipts of the railway have taken quite a material jump since the system has been in operation.

The annual statement of the Port Arthur and Fort William Railway System for the year 1910 showed net profits of $52,870. Gross earnings were $143,653, and total operating expenditures $90,783. The net earnings per car mile were $10,251.

The power obtained through the Hydro-Electric Commission will cost the city $22.40 per h.p. This same rate, according to the original agreement between the Kaministiquia Power Company and Fort William, will now be accorded the latter city. The rate to Fort William has been $25.00.

Portage la Prairie, Man.
There is a special committee of the city council at work on the advisability of acquiring the plant of the local electric light company.

Preston, Ont.
The Grand Valley and the Galt, Preston & Hespeler Electric Railways have both arranged for a supply of power from the Hydro-Electric Power Commission, which will be taken from the high tension sub-station here. All the power contracted for by the town with the Commission has now been sold.

Quebec, Que.
By an amendment to the bill enlarging the powers of the Public Utilities Commission, which has been accepted by the legislation committee, the said commission, while authorized to regulate tolls charged by public utilities companies, cannot interfere with contracts made with municipalities.

An action for $25,000 damages has been taken by F. W. Bird & Son, operators of a pulp mill at St. Jean de Neuville, against the Jacques Cartier Electric Company, one of the constituent companies of the Quebec merger, for injuries alleged to have been caused the plaintiffs by the damming of the Jacques Cartier river by the defendants, thus affecting the water supply used by the mills. An injunction has also been asked against the company.

Regina, Sask.
The by-law providing for the expenditure of $100,000 for power extension was carried.

A bill is now before the legislature which provides for a tax of 2 cents per acre on all land in the province for telephone purposes.

Renfrew, Ont.
The council have decided to proceed with the construction of the municipal power plant from plans prepared by J. B. McRae, C.E., Ottawa. Estimated cost, $100,000.

The waterworks committee has accepted the proposition of the Renfrew Power Company, to build a reservation dam on Round Lake. The town will submit a by-law to the ratepayers to raise the money for half its cost. The power company intend to commence work immediately. The dam is to be built on the outlet of Round Lake, on the property of Mr. Foy, this site having been secured.

Sarnia, Ont.
The council has appointed a committee of three to consider the purchase of the Sarnia Gas and Electric Light Company. A proposal for the amendment of the gas company's franchise was temporarily vetoed at a recent meeting of the council and the question of municipalizing the plant is being discussed, one of the reasons actuating the council in this connection being the hope that before long it will be possible to secure Niagara power direct from the Hydro-Electric Commission. At present this depends to a considearble degree upon what action may be taken by Windsor.

Saskatoon, Sask.
The council of the city of Saskatoon announces that it is prepared to receive proposals for a franchise for an electric street railway system.

Sherbrooke, Que.
The contracts for machinery to be installed on the Magog river municipal power plant have been awarded to the Canadian Westinghouse Company and the Jenckes Machine Company.

Mr. Beattie, of the firm of Morrow and Beattie, Peterboro, Ont., has arrived in town and has begun operations at the

Drop Off. The above firm has the contract for the completion of the dam at this point.

Sault Ste. Marie, Ont.

In connection with the developments of the Lake Superior Paper Company, it is stated the power company is planning the construction of another power canal and a plant capable of developing 40,000 h.p.

Strathcona, Alta.

The city council adopted a report from the power house committee recommending the acceptance of various tenders for the supply of $45,031 worth of electrical machinery to be installed by October next in the municipal power house. The tenders accepted were 600 kw. generator to Chapman Walker, Toronto, $10,160; Burnham regulator, Gorman Clancey & Grindley, Edmonton, $750; generator engine, Goldie & McCulloch, Galt, $12,900; 2,500 h.p. boilers, Goldie & McCulloch, $12,750; smoke stacks, fans, etc., Canada Foundry Company, Toronto, $7,304; 2 feed pumps, etc., Canada Foundry Company, $1,167. The machinery will double the present electrical generating capacity of the city power plant and is urgently needed.

St. Boniface, Man.

An application was recently made to the St. Boniface council for the use of the council chambers for general meetings of all electrical workers and contractors in both Winnipeg and St. Boniface to form themselves into an association for the purpose of discussing electrical subjects and other affairs pertaining to this line of industry. The council stated they were only too pleased to grant the request and that the hall would be placed at their disposal . R. J. Swain, city electrician of St. Boniface, represented the new association.

St. Frances, Ont.

The Ontario and Minnesota Power Company have a number of men at work converting the five undeveloped units in the Canadian power house into a pulp mill. Three grinders will be placed in each unit making fifteen in all

St. John, N.B.

The public utilities comission has given judgment over-ruling the New Brunswick Telephone Company's contention that the commission did not have the necessary power to enquire into the complaints of the Board of Trade committee of excessive telephone rates. The case will proceed at once.

A bill has been introduced in the New Brunswick legislature to incorporate the New Brunswick Electric Power Company. It is the intention of the company to develop a falls on the Lepreaux river at a point about 25 miles from St. John and to transmit to St. John city and other municipalities. The falls are calculated to develop from 2,500 to 5,000 h.p., depending on the extent to which the storage system is developed.

A bill before the legislature introduced by J. E. Wilson, M.P.P., seeks the incorporation of a company to harness the Lepreaux river and generate electric power for transmission to St. John, the company to be known as the New Brunswick Hydro-Electric Power Company. Incorporators, C. H. Easson, manager, Bank of Nova Scotia, St. John; W. E. Foster and Percy W. Thomson, St. John, and H. H. Beck, Toronto. Capital, $1,500,000.

Toronto, Ont.

A bill will probably be introduced in the legislature providing for the appointment of a commission to manage the city's electrical business.

The current issue of the Ontario Gazette announces the incorporation of the Northern Ontario Light & Power Company, with a capital stock of $7,500,000.

The February gross receipts of the Toronto Railway Company were $335,108, and increase of $27,334 over the same month of 1910. The city's percentage amounts to $48,039.

Ald. McMurrich's motion to set aside $500,000 per annum from the street railway earnings to buy out the company at the expiration of its franchise was voted down in council.

The city has been refused its request for power to expropriate the electric line from Sunnyside to Long Branch, but is given permission to expropriate from Sunnyside to the Humber.

Gross income of the Toronto Electric Light Company for the year 1910 amounted to $1,502,798, as compared with $1,292,545 in 1909. The net profits were $657,200, or over 16 per cent. on the common stock. The assets of the company are now valued at $6,690,000.

The Hydro-Electric Power Commission will call for tenders for material for some ten miles of transmission lines from a point on the Severn river to the towns of Midland and Penetanguishene. Tenders will also include material for transformer stations.

The Ontario Railway Board has ordered that the Toronto and York Radial Railway up Yonge street is not to be double-tracked from the C. P. R. tracks to the Golf Club grounds, but that the radial road put in enough switches and turnouts to enable them to give a ten minute service to Glengrove.

The report of City Engineer Rust and Electrical Engineer Aitkin on the question of installing storage battery operated cars on Toronto's suburban lines was not strongly in favor of such cars. The report recommends that a coach be purchased and tried out on the Toronto Railway lines.

The city council will make the Toronto Electric Light Company an offer of $125 per share for their $4,000,000 of common stock, assume $1,000,000 of 4½ per cent. bonds and take up the company's agreement with the Toronto Power company. This price, with certain liquid assets is calculated to net the shareholders about $135 a share.

The railway committee of the legislature recommended that power be granted the Toronto Suburban Railway Co., to issue securities to the extent of 75 per cent. of actual expenditures in respect of bridges over the Humber at Lambton Mills and Weston, a bridge across the Credit river, and the purchase of right-of-way terminals, and station buildings in Toronto, Guelph and Hamilton.

An order winding up the Electric Steel Company of Canada, appointing William Hill, of Welland, interim liquidator, was made by Mr. Justice Middleton. The company was organized in October, 1909, with a nominal capital of $100,000, with its head office in Toronto. Half the stock was subscribed and the rest was given for patents. The plant, the value of which is placed at $25,000, has been shut down since December 1st last.

The Board of Control have decided to advertise for tenders for a railway construction plant — comprising traction steam shovels, dinky locomotives and two-way dump cars—either new or second-hand. The estimated cost of the former is $55,108, and the latter $42,705, or a difference of $11,400. This plant is needed in connection with the construction of the new civic car lines. The engineers estimate they will have to deal with 100,000 cubic yards of excavations and 140,000 cubic yards of filling. City Engineer Rust estimates the cost, including the purchase price of plows, scrapers, etc., at $104,871.30, less the value of the plant at the close of operations, which he estimates at $13,923, or a net cost of $90,948.30.

Trenton, Ont.

This town is advertising widely the advantages of its cheap power. The prices quoted are: 20 to 50 h.p., $18; 50 to 100 h.p., $16.50; 100 h.p., $15. Arthur Jones, secretary, Board of Trade.

Vancouver, B.C.

The contract for supplying ornamental lamp standards for Hastings street has been awarded to E. A. Earle & Company.

On and after March 3 passengers will not be allowed to ride on the front platform of any of the B. C. Electric Railway Company's cars. This action is being taken in obedience to one of the provisions of the new provincial Railway Act.

The Canadian General Electric Company were awarded the contract for supplying 2,000 tungsten lamps for the Granville standards at $1.25 per light. The Northern Electric Company submitted a tender of $1.28 on the same lamp for a similar quantity.

Information has been received at the local offices of the B. C. Electric Company that the directors of the company at London have authorized the construction of the peninsular line from Victoria to Saanich, and that over $750,000 will be appropriated for the purpose of construction and equipment.

The plans of the Vancouver Gas Company, subsidiary to the B. C. Electric Railway Company, in the development of a gas producing plant, call for a large expenditure on plant, wharves, buildings, supply mains, etc., to the amount of about $1,500,000. Of this about $600,000 will be spent this year. Acting general manager Glover.

City Engineer McCrossan, assisted by Manager Dewees, representing the theatre managers, and Mr. Fletcher, representing the employees, has made a practical examination of all moving picture operators in his office before grant ing them permits to operate machines. For this purpose picture machines of various makes have been installed and applicants are not only required to answer questions dealing with mechanical arrangements, but to operate these machines as well. Requirements of this nature have recently been incorporated in the city by-laws making it compulsory for all operators to obtain a permit before taking a situation.

Victoria, B.C.

It is the intention of the city to install about 150 lamps at various points.

(Continued on page 66)

SIEMENS

THREE PHASE TRANSFORMER
12,500 K.V.A. 40,000 VOLTS

FIVE Supplied to
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PENANG	HANKOW	TAIREN	MEXICO	CONCEPCION
RANGOON	TOKYO	JOHANNESBURG	BUENOS-AIRES	RIO DE JANEIRO

The order will be further extended on the ratepayers apprising the electric light committee. Chairman, Ald. H. M. Fullerton.

Wolseley, Sask.

Announcement has been made by the provincial government of the erection of a long-distance telephone line from Wolseley to the Manitoba boundary.

Wilkie, Sask.

Tenders addressed to T. A. Dinsley, secretary-treasurer, have been received for the drafting of plans, etc., of the cost of electric lighting, etc., for this municipality.

Winnipeg, Man.

The appointment of a manager to take charge of the city's power and light business, is to be made in the very near future.

The Winnipeg Electric Railway Company has announced a voluntary increase of two cents an hour for motormen and conductors, going into effect April 1.

The legislature has decided unanimously to memorialize the Dominion government to amend the railway act so as to compel railways to put telephones in all their stations.

Tenders addressed to chairman, board of control, will be received until May 1st for supply and delivery, f.o.b. Winnipeg, of ornamental lighting standards of approved designs. Plans, etc., at office of city electrician; M. Peterson, secretary.

The Manitoba Power Company directors are reported as follows: H. A. Lovett, director Canadian Light & Power Co.; D. L. Mather, Winnipeg, president Keewatin Lumbering Co.; C. H. Cahan, K.C., Montreal, president Western Canada Power Co., solicitor Bank of Montreal; R. R. Muir, president R. R. Muir & Co., Winnipeg; J. W. McConnell, Montreal; E. B. Reese, president Reese Engineering Co.; A. C. Muir, Winnipeg; A. J. Nesbitt.

Sir William Mackenzie, president of the Winnipeg Electric Railway Company, has offered the city the following alternatives: (1) The company will sell its street railway, gas, power, and electric light outfit to the city as a going concern; Mr. Mackenzie said the company would sell out on a basis of $250 a share. On this basis the company's full price would be in excess of $15,000,000; or (2) the company will purchase from the city 15,000 horse power as soon as the city is in a position to deliver it, at a price which will pay interest on the city's entire investment in its municipal plant at Point du Bois, on condition that the company shall be permitted the exclusive right to engage in commercial lighting.

The following contracts for the ensuing year have been awarded by the Manitoba government telephone commission: Poles, J. L. Hyland Company; hardware, Miller, Morse and Company, J. H. Ashworth Company, and Northern Electric Company; insulators, Pittsburg High Voltage and Insulator Company, and August Fibiger; copper wire, Wire & Cable Company, and Eugene F. Phillips Electric Works; iron wire, Steel Company of Canada and Northern Electric Company; cable, Wire & Cable Company; cross arms, side block and top pins, etc., Northern Electric Company; Tri-Provincial Electric Supply Company, West Canadian Lumber Company, and Brown and Rutherford; underground conduits, Tri-Provincial Electric Supply Company.

Yorktown, Sask.

The municipal lighting plant of Yorktown, Sask., will be completed shortly. They are using the series tungsten system for lighting the residential streets and will have ornamental posts similar to those in Ottawa for the business section. The prime mover for this plant is a Diesel oil engine using crude oil, the only installation of its kind in Canada.

Condensed Department

RATES

Positions Vacant Positions Vacant Miscellaneous	2 cents a word and 25 cents for a heading, per insertion

Tender advertisements, equipment for sale, etc. 15 cents per agate line. 14 agate lines make one inch per insertion.

Advertisers who wish to conceal their identity may do so by using an Electrical News box number without extra charge.

Forms close on the 18th of each month.

For Sale

One S.K.C. Dynamo, 2 phase, 60 k.w., 1,040 volts, 133 cycles, 1333 revolutions per minute, including switchboard and instruments, with exciter, Edison 1½ k.w., with spare armature. This outfit can be seen running at plant of the Alliston Electric Light Company, Alliston, Ont.; the reason for selling is that this machine is being replaced by a larger one. 3-6

For Sale

The Board of Power and Light Commissioners of Ingersoll, Ont., have for sale for immedate shipment, two 25 h.p. Induction motors, C. G. E. 3 phase, 220 volts, 4 Canadian General transformers, each 15 k.w. capacity, 2,200/220 volts, 60 cycles, S. P. direct current Arc Lamps, direct current motors, 220 and 110 volts from 1 to 40 h.p., and for delivery within a few weeks, steam engines, boilers and general steam plant accessories. Particulars on application.

W. R. REYNOLDS,
Superintendent.

11-13

WANTED

A large and well equipped factory, will make under contract or on royalty metal specialties, electrical device preferred. Will buy outright any patent article of merit.

For further information, address Box 248, Electrical News, Toronto, Ont. 4-4

Positions Vacant

WANTED—Power Salesman [illegible] 25 [illegible] Only first class [illegible]. Please state experience and salary expected. [illegible] Power Salesman [illegible] H. [illegible] General Superintendent [illegible] Ont. 4-4

WANTED—A [illegible] to [illegible] [illegible] experience [illegible] with [illegible] Public [illegible] Must have [illegible] good [illegible] born, age, education, positions held, salaries received [illegible] Box 233 [illegible] Electrical News, Toronto, Ont. 4-4

Wanted

Electrical superintendent to [illegible] distributing system [illegible] installation in a small city near Toronto. Applicant must have full knowledge of practical electric construction indoors and outdoors, and must be able to make repairs [illegible] and poles and do other [illegible] work. State full particulars, salary expected.

Address Hydro-Electric Power Commission
Continental Life Building,
Toronto. 3-3

Positions Wanted

Electrical Engineer

English, age 24, technical graduate. Experience, three years drafting; 4 years installation and testing; 2 years central station. Box 229, Electrical News, Toronto, Ont. 3-3

Electrician, single, age 26, desires change. Present employed as foreman with firm of electrical engineers. Has had three years theoretical and seven years practical experience with electrical apparatus, laying out and installing lighting and power systems. Can handle men and understand estimating, etc. Box 227, Electrical News, Toronto. 3-3

Steam and electrical engineer, Scotsman, married, over 8 years chief engineer and manager public electrical supply, in Scotland, varied general engineering experience, first class references as to character and professional ability, arriving in Canada early in April, desires to hear of suitable opening, British Columbia preferred. Address Box 219, Electrical News, Toronto, Ont. 3-4

Young man completing third year in Electrical Engineering at McGill desires position for summer months with engineering firm engaged in hydro-electric installation—preferably in British Columbia. Energetic worker and absolutely steady. Three years practical experience in small electric installations. Address, Box 213, Electrical News, Toronto, Ont. 3-4

Energetic young man (25) desires position, in executive or assistant capacity, with central station, electrical manufacturing, or electric railway company in Toronto. Not a technical graduate, but possessing good general knowledge of electrical subject, central station management, policy, rates, etc., and accounting. Address, Box 240, Electrical News, Toronto, Ont. 4-4

POSITION WANTED as electrical engineer, superintendent or manager of an electrical supply system or in a position of responsibility in an engineering firm. First class experience in constructional, central station operation, lines inside and outside. Estimating and commercial work. [illegible] experience in Orient, and would be useful to export manufacturing company. Address, Box No. 247, Electrical News, Toronto, Ont. 4-4

Miscellaneous

AGENTS WANTED [illegible] all parts of Canada to handle wood preserving for Poles, Cross-Arms, Railroad Ties and Construction Timber. For particulars write W. D. Ward, Tribune Building, New York. 2-4

Agents Wanted

[illegible] manufacturing [illegible] mechanic's tools, and portable sawrigs for builders, contractors and lumber yards. [illegible] representative. For particulars [illegible] Box 223, Electrical News, Toronto, Ont. 3-3

An Improved Induction Watthour Meter

The Sangamo Electric Company have brought out an improved form of induction meter which will be known as the type "H" (High Torque). This meter, in common with all induction types, employs the well known rotating field principle discovered by Ferraris about 1886. The Ferraris principle depends upon the interaction of two or more magnetic fields of different phase, so related and located with respect to each other as to produce a rotating field acting upon a movable low resistance armature. The simple field

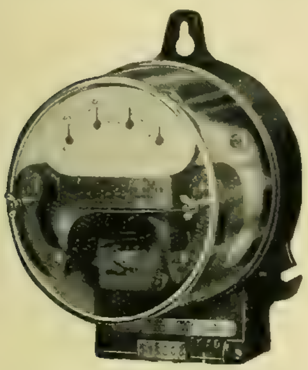

Fig. 1

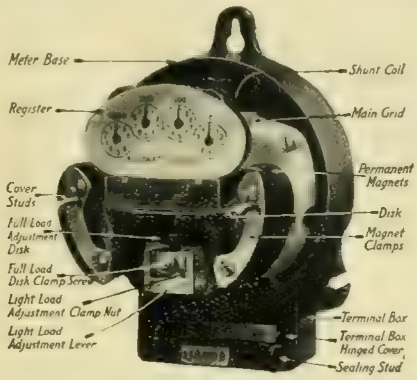

Fig. 2

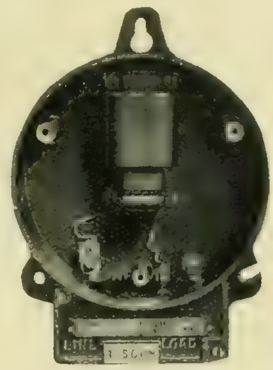

Fig. 3

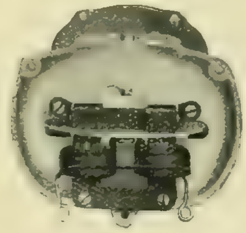

Fig. 4

arrangements characteristic of all Gutmann meters with the additional improvements suggested by ten years' experience in the meter art have been incorporated, thus securing a construction which will insure high initial and permanent accuracy.

The complete meter is shown in figures 1 and 2, the latter with cover removed and the principal elements indicated. Figures 3 and 4 show the main grid removed from the base, giving a clear idea of the structural features.

The main grid is made of vanadium-aluminum alloy. The moving element consists of a light aluminum disc mounted on a short shaft, the entire system weighing 18 grams. The upper pivot is made of highly tempered steel wire, and of such diameter as to be quite flexible in the length between the top of the shaft and the guide ring in which it rotates. The lower pivot arrangement consists of a hardened polished steel wire tip having both ends rounded and polished. This tip slips friction tight into a hole drilled in the lower end of the brass shaft split so as to compress on and firmly hold the pivot. When one end of the pivot has become worn or injured, it can be easily withdrawn, reversed, and when pushed in, gives an entirely new pivot on the other end. The lower bearing differs from that used in any previous forms of induction meters, consisting of a ring stone and end stone of high grade sapphire instead of the usual cup jewel used in other meters. It is the same construction as used in all watch bearings. The bearing adopted offers several advantages over the cup jewel as it is possible to obtain absolutely perfect end stones, easily inspected merely by reflection of light from the flat surface, so that the least flaw is immediately detected.

Electrical News
Operation, Transmission and Application of Electricity

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ADVERTISEMENTS.

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Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 20 Toronto, May, 1911 No. 5

Our Special Electric Railway Issue

The importance that electric railway service is assuming in Canada and the all too scant consideration we have afforded the problems of the electric railway man in the past has prompted us to offer present compensation in the form of a special issue devoted entirely to electric railway operations and to resolve that future issues shall deal in a systematic way with such railway problems as may be found most useful to Canada's growing needs.

In the present issue we are very glad to be able to present two forceful articles on what is probably the most outstanding problem in the electric traction world to-day—the relative merits of the a.c. and d.c. motor. As is well known, Canadian practice is uniformly direct current operation at about 600 volts, a type of motor well suited to city or town conditions and also owing to its rugged characteristics, calculated to operate with a minimum of attention and electrical skill. Where distances are greater 1,200 volt or higher direct current motors have been used in the United States and still more numerously on the continent. In most such cases each pair of motors is capable of being operated in two units or in series. This is often taken advantage of to operate one part of the line at the higher voltage and another part at half that voltage.

A keen competitor of the higher voltage d.c. motor is to be found in the single-phase a.c. type. For trunk lines especially this system appears to be giving highly satisfactory results, Mr. Murray's recent paper before the Toronto Section of the A. I. E. E. being a strong argument in its favor under such conditions as are found on long lines operating heavy loads at a comparatively uniform speed. The higher voltages applicable to this system, not less than 11,000 according to Mr. Murray, also go far to eliminate heavy transmission loss.

Three-phase operation appears to be much more limited in its application. It is used, to advantage, in Switzerland, where the grades are unusually heavy, and may be found applicable in the operation, for example, of either of our present steam lines over the Rocky Mountains. The three wire feeder system, however, is a factor making for expensive installation as well as complicated operation.

In addition to these three types there is the increasingly popular railless car operated by trolley like the others but free to follow its own path below. The exceptionally low installation cost favors this type of car which is being installed in a number of towns in England and seems to lend itself to usage in small towns or suburban districts where the small population to be served would not justify heavy rail expenditure. Of this type also is the storage battery car, the car which would seem to be the solution of suburban and light interurban service. This, however, has resolved itself mainly into a battery problem.

Electrical Standards Laboratory

Readers of the Electrical News are familiar with what is termed the Electrical Standards Laboratory at Ottawa, that branch of the Inland Revenue Department which, among other things, provides for the inspection of electrical meters. Under the very capable direction of Mr. Ormond Higman, the services rendered by this Department to the light and power companies of Canada have been as efficient as could be expected under the conditions existing and with the machinery which the government has provided for the execution of the work, but we think that the Department has not been given the status or the equipment to which it is entitled by the importance of the industry it represents and the nature of the work it should perform. Rightly enough, it should be controlled by the Minister of Inland Revenue, but as a separate and distinct branch, with an official head directly responsible to the Minister. The importance and growing magnitude of the electrical industry, representing a capital investment of probably $150,000,000, should long ago have brought forth an appeal that the active administration of both electricity and gas be divorced from (say) that of spirits and tobacco. Electrical interests, as a body, have not presented their case and therefore cannot honestly blame the government, but should we not now ask for some such scheme as the segregation of the electrical, gas, weights and measures and kindred services and their incorporation as a distinct branch of the Department? Might not the Canadian Electrical Association place the matter before the government by a strong deputation? We will have further comment on the subject in the next issue, and invite opinions from our readers in the meantime.

Forty Per Cent. Expansion in Electrical Trade

No better indication of the rapid expansion of electrical trade in Canada is needed than the annual report of the Canadian Westinghouse Company for 1910, which shows an increase in factory output over the year 1909 of approximately 44 per cent. The net profits for 1910 are $697,393, also an increase of 40 per cent. over the previous year. In summing up the past year's progress the following points were noted by the president. The sternness of competition due to numerous foreign entrants is noted as an important factor :—

"The sustained and increased demand for apparatus of all types in the electrical field, and the stability of orders for air brakes, have enforced a continual and cumulative growth of manufacture to satisfactorily care for these desir-

able conditions. The volume of business offered in the latter part of 1909 and in the early part of this year made it apparent that some additional space would be required to facilitate its handling. Extensive additions to the warehouse and retail buildings were undertaken and are about ready for occupancy, and an extension of the foundry building, about doubling its capacity, is under way and will be completed with the opening of spring. The probability of still further increased business raises the question of additional machine shop facilities at a not distant date.

"The insistent demand for apparatus involving the highest development of engineering and manufacturing skill has continued, and the large share of business with which the company has been favored in standard and special lines, particularly in those fitted for the extensive generation and distribution of high voltage electrical energy and its economical application to various industrial uses, demonstrates the standing accorded it throughout the Dominion.

"A new high record for sales has been reached during the year, approximately an increase of twenty-five per cent. over 1909, the period of previous maximum. The larger volume has come from extensions to existing plants as well as from numerous new power developments, and has been well distributed geographically from ocean to ocean. Competition has been keen at the hands of home and foreign manufacturers, the latter having been reinforced by additional entrants attracted by the large developments undertaken in Canada."

A. I. E. E. Toronto Section

The 260th meeting of the A. I. E. E. was held in the C. & M. Building, University of Toronto, on April 7th, under the auspices of the Toronto section of the institute. A paper was presented by Mr. W. S. Murray, electrical engineer of the New York, New Haven and Hartford Railway Company, on the subject "Analysis of electrification and its practical application to trunk lines for freight and passenger operation.

This road is considered the most successful example of single-phase operation in the world to-day, and in his introduction, Mr. Murray states it to be the object of his paper "to preach the doctrine of universal use of single-phase current on trunk line roads inclusive of suburban and terminal territory as applied to freight and passenger operation."

Mr. Murray offered for consideration the standardization of 11,000 volts on the contact wire and a system frequency of 25 cycle. This voltage was recommended as the minimum.

The paper dealt in a very definite way with the operating features of Mr. Murray's road over the last three years. The New Haven road now operates 300 miles of this track of single-phase, and is adding 150 more which will make a total, with sidings and yards, of nearly 500 miles.

New Plant Operating at Weyburn

Power has been turned on at the new municipal steam power plant at Weyburn, Saskatchewan. The plant has been built to supply not only the present needs but provision has been made for enlargement as the town grows and the demand for light and power increases. The new plant will not only develop electricity for power and lighting, but will also operate the pumps in connection with the waterworks system and sewer systems. The plant is housed in a fireproof brick building, 60 x 100 feet, and ample space is provided for additions without interfering with the operation of the other units. The power house is located close to the Souris river from which an ample water supply is secured and is served with a spur track where fuel from the mines south on the Soo line can be cheaply and advantageously handled.

The power equipment consists of a 15 and 30 x 30 cross-compound Corliss engine, direct connected to a 250 kilowatt alternating generator and one 14 x 24 Corliss engine to a 75 kilowatt generator. The electric light plant now operates over thirty street lamps and about 6,000 incandescent lights in stores and residences. It is the intention of the town council to furnish a continuous power service.

The water pumping machinery at the wells, a mile west of town, consists of one 50 h.p. gasoline engine and one 50 h.p. motor, both attached by gears to two 8 x 12 double-acting pumps, thereby insuring a continuous water supply. The capacity of the pumps is 300 gallons per minute each.

Fifty Per Cent. for Canadian Side

The warfare that has been continuously waged between the town of Fort Frances and Mr. E. W. Bachus as to the use of power being developed by the latter, on the Rainy river, has resulted in the passage of a bill in the Dominion House requiring the utilization on the Canadian side of the river of fifty per cent. of the total power developed at any time. The question came up some months ago and a temporary arrangement was made with Mr. Bachus by which he was required to utilize on the Canadian side only one-half of that developed on the Canadian side. This half amounted to about 3,500 horse power and following the order Mr. Bachus was proceeding to install pulp grinders in Fort Frances to use this amount of power.

It is thought by the citizens of Fort Frances, however, that Mr. Bachus has no intention of manufacturing his pulp in Canada and an injunction has been applied for at Ottawa restraining him from installing the grinders and requiring him to build a mill.

In the meantime the council is busying itself to find a market for its half of the developed power and the clerk has been instructed to apply at once to the Minnesota & Ontario Power Company for prices on electrical energy and hydraulic power on the schedule plan, including in schedule, power from 1 to 17,500 h.p. for the following purposes: pulp mill, paper mill, flour mill, general factory purposes, lighting, etc., stating when such power can be delivered and full particulars as to how they are prepared to deliver same.

Development of Grand Rapids

The city of Edmonton will ask the Dominion government for an extension of time in which to decide whether or not to accept the terms of development at Grand Rapids. If the time is extended the question will be submitted to a popular vote. In the meantime it is understoood that the interests represented by Mr. Voilette & Engineer Neville have been promised second choice of this site by the government. These latter interests have also made the city of Edmonton a very fair proposition ranging from $15 up if 30,000 h.p. or less is delivered at the city limits or from $10 up for the same amount at the power house. A rough estimate of the total capital cost of 30,000 h.p. delivered at the city limits is $5,000,000.

Millbrook Light and Power Taken Over

The local plant of the town of Millbrook has been recently acquired by the Central Ontario Power Company, a subsidiary of The Electric Power Company. It is the intention of the latter company to run a branch of their high tension system in the neighborhood of Millbrook and install a small stepdown sub-station there. When this is accomplished the town will be enabled to operate an economical twenty-four hour service.

Waterpowers on Shipshaw River

The Shipshaw river is situated in the county of Chicoutimi, Quebec, and is a tributary of the Saguenay, the river which connects Lake St. John with the St. Lawrence. A recent survey by Mr. C. E. Gauvin, hydraulic engineer, to the Quebec government, now issued in the 1910 report of the Department of Lands and Forests, Quebec, shows waterpowers on the Shipshaw river in upstream order and size as follows:

	Head.	H.P.
1. Wilson Falls	31	1700
2. Murdock Falls & Rapids	80-90	4800
3. Chute a Guimond	25-30	1500
4. Chute du Noye	4-5	250
5. Chute du Portage	15	850
6. Chute a Gagnon	25	1450
7. Chute au Caribou	15-20	1000
8. Chute des Galets	75	4000
9. Chute de L'Equerre	60	3300
		18,850

The length of the river is about 100 miles and its minimum flow estimated not less than 500 foot seconds. The Murdock Falls will probably be developed by a group of men including Messrs. D. Maltais, E. Tremblay, V. N. Tremblay, and L. G. Belley; some work on a dam has already been done. Falls Nos. 3, 4, 5, and 6 may be leased to the Pulp Company of Chicoutimi, who have made application for them. Mr. Wm. Price, of Price Bros. & Company, is said to be investigating the possibilities of the last three falls with a view to utilizing the power in the numerous lumber mills of that company.

Illinois Traction Operates two Sleepers

The Illinois Traction Company has placed in commission two sleeping cars to run between Peoria and St. Louis. In working out the idea for their construction an attempt was made to do away with all the uncomfortable things on a regulation sleeper, and produce something different that would ensure a restful night's sleep. The sides go flush to the roof, which is high and rounded in what is known as the turtle back construction. This does away with deck lights shining into the upper and also allows the placing of windows in the top bunk. One important feature is that the berths are six inches longer than those in the standard Pullmans. At the head of each berth is a plush lined steel locker, built in the side of the car; this is for holding valuables and works on the safety deposit plan, the conductor retaining one key and the passenger the other. Both upper and lower berths are provided with electric lights, ensuring a steady light for reading. Lower berths fold up against the side of the car, making a small stateroom for dressing. To assist in this a folding chair is discovered under the berth. Last, but not least, of the novel features that will go a long way to popularize the new sleeper service with the travelling public is the idea of General Manager Chubbuck to serve free, hot coffee, hot rolls and creamery butter in the morning.

Calgary Installing Ornamental Lamps and Standards

The tenders of the Canadian Equipment & Supply Company and of the Canadian General Electric Company have been accepted for the supply of 100 each ornamental street standards and equipments similar to the Toronto type. The price is $56.50 each, including globes, sockets, cutouts and the wiring of the posts. The globes will be one 14-inch and four 12-inch diameter on each post. The new switchboard and apparatus for the new power station will be installed by the Canadian Westinghouse Company.

Forced Hot Air System

General Manager M. O. Robinson, of the Port Arthur and Fort William Electric Railway system states that they have on trial on one of their cars the forced ventilation hot-air system. Although they did not have this in operation in the coldest weather, it has been 15 below zero since it was installed, and at that temperature it proved to be superior to the electric heaters. The good features of the system are that the air in the car is continually being changed, being taken from outside, heated and forced into the car by a fan. It has the advantage over the hot water that there is no danger of frozen or leaky pipes; also it is one-half the weight and when the heater is taken out for the summer the car is not so heavy even as with the electric heaters. The cost of operation in comparison with electricity is said to be less than one-half.

Light and Power for Porcupine

The mining town of Porcupine is to have electric light and power as soon as possible. Messrs. Ross & Holgate have prepared plans and estimates for a plant to be situated at the Wawatian Falls on the Moose river branch of the Mattagami river, and tenders were asked for, to be sent in during the first week in March.

The Wawatian Falls were described in the July, 1910, issue of the Electrical News as having a natural head of 60 feet, an approximate drainage area of 1,000 square miles, an estimated minimum flow of 400 c.f.s., an estimated discharge under controlled storage of 1,000 c.f.s., a minimum development of 2,700 h.p., and a maximum development under discharge control of 6,700 h.p.

During the approaching summer an hydro-electric lighting and power plant will be installed in the town of Magog. It will be a 1,200 h.p. plant for which the specifications have been prepared by Messrs. Ross & Holgate.

Wireless in New Zealand

The first wireless telegraphy station to be fitted up in New Zealand is on the tower of the Post Office at Wellington. During the next twelve months, two high-power and five low-power stations will be erected throughout New Zealand. One high-power station will be erected at Doubtless Bay, and the other at the Bluff. Each will be capable of keeping up communication with the continent of Australia. The low-power stations will be erected, one each at Gisborne, New Plymouth, Christchurch and Wellington, and also one on board the government steamer Tutanekai.

Experiments which have been conducted by officers of the Telegraph Department at Wellington have demonstrated that the smaller stations can conveniently be erected on the roofs above the post offices at the places named, a course which will materially reduce the cost of upkeep, as the stations will be under the immediate charge of the postmasters. The high-power stations, however, will be independent units, staffed by special staffs, and remaining open day and night.

When the proposed stations are erected, every corner of the coast and the oceans surrounding New Zealand within a considerable radius will be within the field of the wireless telegraph system.

Fort William Extensions

A report has recently been made by Mr. R. S. Kelsch, consulting engineer, on the street railway situation in Fort William. The report advises the replacing of the two present installed and much-worn motor generator sets of 175 kw. and 350 kw. capacity by a single 500 kw. capacity unit. The purchase of a storage battery is also recommended, to carry the peak load, at a suggested cost of $20,000 to $30,000, and new switchboard arrangements, to cost about $4,000.

Toronto Railway and Life-Saving Devices—Company Co-operating with Ontario Railway Board

In connection with an advertisement now appearing in the technical and daily press of Canada and the United States inserted by the Toronto Railway Company, a short description of what this company hopes to accomplish, and the means taken to obtain results, are of great interest.

The advertisement reads as follows:—

"Inventors and others interested in life-saving devices, are hereby invited to submit to the company, plans, rough drawings, or models of any device to be used upon the cars for the prevention of accidents."

Some time ago, upon the application of the Toronto Railway Company, The Ontario Railway & Municipal Board made an order appointing Mr. J. F. H. Wyse, consulting engineer, to co-operate with the company in devising or investigating any reasonable method for preventing destruction of life.

After an investigation Mr. Wyse concluded that the condition of Toronto's pavements were such as to render impossible the proper operation of any life-saving device, however efficient it might be. For example, it was pointed out that the paving blocks close to the rails were raised in a number of cases over 2½ inches high, and in several cases 3 inches or higher. As pointed out in this report, no apparatus could be dropped close enough to the rails to be effective, and further, such life-saving apparatus must be carried too far from the ground to be operated quickly enough. Mr. Wyse's recommendation at that time was that the "parties responsible for the condition of these pavements should immediately take steps to place and maintain the pavement upon the track allowance even with the top of the rails so that no part will hereafter project above the rails." In this connection a sentence in Mr. Wyse's report shows the importance of attention to this matter where he says "a single high paving block on a route will destroy the safety apparatus of every car operating on that route."

A couple of photographs shown herewith will illustrate this point. One of them shows a life-saving device as it left the shops, the other shows a similar device as it was photographed after being in service a very short time. It is evident that however effective this guard may have been when it started out on its trip, it soon became not only ineffective but an actual menace to the life of any living thing that might come in contact with it.

The third photograph shows a complete set of guards of the latest type, designed by the company's master mechanic, Mr. Walter McRae. These are placed in the five positions shown, one each in front of the car, before the front wheels, between the trucks, before the rear wheels, and behind the rear wheels. On car No. 1428 these guards were placed 2¾ inches above the rail, and appeared to be an absolute protection, if they could be maintained at that height with the car empty, making allowance for the car settling under loaded conditions. To all appearance they represented the most efficient life-saving devices that have ever been operated, but the condition of the pavement adjacent to the rails, unfortunately, rendered the removal of all these guards necessary at the end of the trial trip, and their being re-set at a greater height.

At the present time Mr. Wyse is receiving applications in response to the railway's advertisements, studying all suggestions and devices submitted, that seem applicable,

Figs. 1 and 2.—Destruction of Life-Saving Device by Bad Pavement.

with a view to recommending for the Ontario Railway & Municipal Board's approval those that are efficient.

It is abundantly evident that if there is any way of saving lives, as far as the railway company is concerned it will be done.

It cannot be forgotten, however, that the best preventative of accidents is caution on the part of the public.

It is very much to be regretted that the recent order that all passengers must leave by the front door, has not lately been enforced. Mr. Wyse is of the opinion that the chief cause of accidents is that people, either passengers, or pedestrians cross along the rear of a standing car without looking, and are caught by a car approaching in the opposite direction, and he believes that no method of equipping the coaches will be anything like as effective as caution, care and watchfulness on the part of the public.

British Line to be Electrified

It is said that the London, Brighton & South Coast Railway Company has met with such success in the electrical operation of a portion of its suburban lines that it will electrify the whole system of 479 miles and that it is expected to have the service in operation in 1916.

Fig. 3. Toronto Railway Car Equipped with Watson Fender and Complete Set of Guards

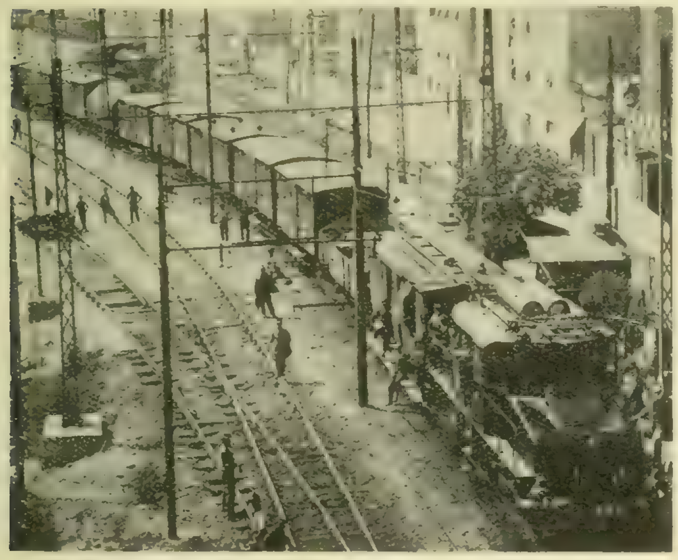
The Three-Phase Operation of Electric Railways—Used for Heavy Work in Italy—Regenerative Feature

A report of a three-phase installation of the Giovi line of the Italian State Railway has just been made by the Italian Westinghouse Society, and is interesting as representing one of the few three-phase electrically operated railways in the world to-day.

The Giovi locomotive is built for freight service and has a normal operating speed of 28 miles per hour. It is also used for passenger service, however, as the speed capacity is as high as is considered safe on the Giovi lines. The locomotive also has a 14 mile per hour speed which is intended for switching purposes and for re-generating power when the train is running down hill.

During the tests a train 418 tons, exclusive of locomotives, was taken with a speed of 28 miles per hour against a maximum grade of 3.5 per cent. and an average of 2.7 per cent. and a minimum curve radius of 1,200 feet.

The motors are three-phase, 3,000 volt, 15 cycle machines, arranged to run in cascade and parallel, giving two



3-Phase Operated Train on Giovi Line, Italy.

synchronous speeds of 112½ and 225 r.p.m. intermittent speeds being obtained by inserting rheostats in the circuits.

The control system contains a number of unique features, one of which is the water rheostat used as a starting resistance. This eliminates all metallic resistance parts which are always more or less subject to burnouts and mechanical breakage. Moreover, in this way all contacts that have to be operated under current in the secondary are eliminated except the one contact which short-circuits the rheostat. A further advantage of this control lies in the fact that the current is not increased by steps but reaches its maximum by the very finest regulation.

The water receptacle is a tight tank so mounted as to extend below the cab for air cooling. Receptacles for the electrodes extend from below the water level through the cover and up into the lower parts of the locomotive, the electrodes being supported in the upper portions of these receptacles.

An important feature of the three-phase installation is found in the utilization of regenerated power which reduces the cost of operating the line and also reduces, by proper arrangement of the schedules, the peak of the load in the generating station and does not require the use of mechanical brakes when the train is going down grade.

Gas Electrically Operated Cars—A Minnesota Line With No Overhead Construction

The illustration shown herewith represents a gas-electric car used on the Minneapolis, St. Paul, Rochester and Dubuque electric line operating between Minneapolis and Northfield, Minn., a distance of 37½ miles. The car measures 62 ft. 6 in. long by 9 ft. 6 in. wide. The frame and

Gas-Electric Car Operating Minneapolis to Northfield.

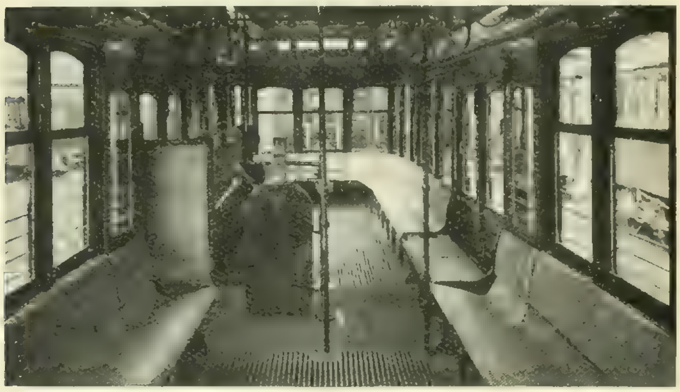
exterior sheathing are of structural steel. The interior is finished in wood but the ceilings are of sheet metal. The car has three compartments, the rear section provided with chair seats, the main passenger section in the centre and the engine room in the front. The engine is of the vertical four cycle type, 6 cylinders 10½ in. by 9 in., giving 150 h.p. at 425 r.p.m. Direct connected to the engine is an 85 kw. 250 V. shunt wound interpole generator. The motors are two G. E. 100 h.p. 250 V., both mounted on the forward truck. The car also carries a battery of 112 cells, capacity 300 amp. hr., to be used for starting and lighting purposes.

All-Steel Cars—Fifty being Installed by the Pittsburg Railway Company

The Standard Steel Car Company, of Pittsburg, is now filling an order for 50 new pay-at-entrance trailer cars of the new centre entrance and exit design. These cars are shown in the accompanying illustrations. The car is completely constructed of steel up to the letter-board with the exception of the floors and seats, and as the entrance and exit are at the centre of one side, the seat extends right around the coach as shown in one of the photographs. Even at the end where the motorman stands a small seat has been set in, back to back with the motorman.

The car seats 62 people and, complete with trucks, hot air heating, and all details, weighs only 22,300 pounds, or

Front End Interior All-steel Pittsburg Car.



Two Views Centre Entrance All-steel Pittsburg Trailer.

360 pounds per passenger. When coupled to one of the railway company's semi-steel pay-as-you-enter cars (two views of the entrance to this car are shown) the two-car train furnishes seating capacity for 118 people. The car is mounted on trucks having wheels 22 inches in diameter, thus the floor can be placed 30 inches above the rail and be on a level with the back platform of the ordinary car. This arrangement requires the use of only one step up to the car and greatly facilitates the loading and unloading as well as the convenience to the company's patrons. The important dimensions of these trailers are as follows: Length over all 45 ft., width over all 8 ft. 2 in., step heights 16 in. and 14 in., heights from the rail to the top of the roof 10 ft. 6 in., truck centres 22 ft. 6 in., wheel base of truck 4 ft. 4 in.

On the long distance lines where a speed of 80 or 90 miles an hour is sometimes attained, considerable difficulty is being found in properly heating these coaches. Where the traffic is only local this difficulty is more easily overcome, though it doesn't seem to be altogether a matter of speed

Rear End All-steel Pay-As-You-Enter Cars

but rather that the heat very quickly radiates from the metal. It is very probable that before this difficulty can be overcome completely, the cars will have to be lined with some non-conducting material such as asbestos which would add practically nothing to their weight and would assist very materially in retaining the heat within the coach.

These steel cars are attracting a great deal of attention at the present time, more especially perhaps on account of the side entrance which is said to facilitate entrance and exit to a marked degree.

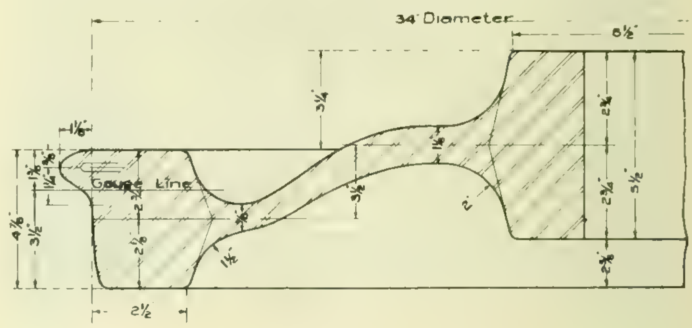
Car Wheels for Electric Service—A Light-Weight Wheel of Standard Design

by Mr. G. Gordon Gale.

Many of the railway companies operating surburban lines at a moderate speed—say 40 miles per hour—are gradually giving up the use of the chilled cast iron wheel in favor of the steel tired and the rolled steel wheel. This latter wheel has shown such good results, both in reliability and length of life, that its use is being very generally adopted.

The standardization of designs and the elimination, as far as possible, of slight differences in the dimensions of wheels in the same service are, of course, desirable from the standpoint of the user because standard equipment is always more economical than special equipment; and from the standpoint of the maker because of economy in manufacture, and the greater facility with which a standard wheel can be supplied.

Where electric cars are operated over existing steam lines, running over standard frogs, etc., wheels having the



M.C.B. flange 1⅛-in. x 1 3/8-in. and tread 3½ in., have been adopted. It would seem that in order to obtain a wheel of standard design having these dimensions of tread and flange, it is at present necessary to purchase from the manufacturers a wheel used in steam railway work, weighing over 900 pounds. The weight of cars for electric service is not as great as that of cars used on steam railways, and it is, therefore, unnecessary to have as heavy a wheel. Comparing the above weight with the old cast iron wheel weighing about 500 pounds, it is evident that by using the improved wheel, the weight per car is increased over one and one-half tons.

The results of tests in connection with the operation of heavy cars, have shown that there is a great saving in the cost of operation by making a reduction in car weights. In view of this, therefore, an increase in weight, as mentioned above, would not be good practice.

A sketch of a wheel, guaranteed by the manufacturers, having the required M.C.B. tread and flange, and other dimensions such that the total weight of the wheel is slightly over 700 pounds, is submitted. This wheel has been in operation with good results on the lines of the Hull Electric Railway Company, and if a sufficient number of roads, operating under similar conditions, should feel sufficiently interested to adopt this wheel as their standard, it would probably result in the manufacturers including it among the standard designs with the consequent benefits to all.

Best Voltage and System in Railway Work

A discussion of the Considerations which affect the Relation of the Voltage and System best suited to Particular Conditions

By Mr. C. R. Darby

1. National prosperity and importance are largely proportional to facilities for intercommunication, and since overland transportation is to so large an extent dependent on railways any development providing for better railway service is of paramount importance. Steam locomotives and electric motors are the two recognized means of applying power which are available for practical railway requirements. The fundamental principles which underlie the problem of train movement are the same in either instance, but a true comparison of their relative advantages can only be made by a study of each particular method.

2. Much that has been written has treated the subject of electrification of steam railways from the general standpoint of averages, but unfortunately the economic application of electricity is not a subject for generalization—unfortunately, because averages are convenient and usually available, but often lead to erroneous conclusions, either for or against electrification. It is a mistake to assume that the average of the expenses for the entire railroad represents the actual expense for the particular conditions usually existing on the division under consideration.

3. On account of the investment already incurred, and because the question is usually one of determining comparative results, the electrification of an existing steam railway is a more complex problem than the electrical equipment of a new road.

4. Electrification, like any other engineering work, involves an investment against which there will be a fixed charge for interest and a liability of depreciation. The interest is a constant and permanent charge which must be met irrespective of any economy which may be secured by intelligent operation. The subject of depreciation is receiving more attention than formerly, the tendency having been to make the operating expenses cover this charge. However classified, the depreciation charge must be accounted for, and it is directly influenced by the character of the equipment with respect to reliability, durability, and capacity to provide for future requirements.

5. The utilization of higher trolley potentials, made possible with direct current by the development of the commutating pole motor and with alternating current by the development of the single-phase motor, the higher speeds of rotary apparatus in the sub-stations, and the development of the steam turbine, have effected a material reduction in the investment required and the cost of operation.

6. The different methods of electrification applicable in any instance should be carefully analyzed with regard to interest, depreciation and operating expense, and only the net result should be given consideration in determining the class of equipment. In this connection it is well to bear in mind that the expenditure is a lump sum which can be accurately determined, while depreciation and operating expense can only be approximated. Reference to the corresponding items of expense on railways operating under conditions comparable to those of the line to be electrified, will supply the most reliable figures. Future traffic developments must not be overlooked and the type of initial electrification should be selected with due regard to the ultimate requirements.

7. There would undoubtedly be an advantage in having the character of the energy supplied to the contact conductor uniform, but this is out of the question on account of the great difference in the requirements of specific conditions, such as congested urban or suburban service and comparatively infrequent trunk line train movements.

8. The sub-station and rolling stock may be equipped for operation with direct current or alternating current, single-phase or three-phase, and what is commonly spoken of as "the system" usually refers only to that part of the general scheme of electrification which comprises the sub-station and rolling stock equipment. There are exceptional cases where the power station and transmission lines have direct relation to the rolling stock equipment; but with the development of alternating current transmission, this is less frequently the case than it was a number of years ago when 600 volt power stations supplied power directly for the operation of 600 volt motors.

9. The development of apparatus for higher voltage direct current has so far increased its scope that direct current at either 600 volts or higher may be considered the most economical for city and interurban service, and for the electrification of steam railways where the density of traffic is sufficient to require a relatively large investment for rolling stock, as compared with that required for the secondary distribution system and the sub-station apparatus.

10. Single-phase rolling stock equipments are generally applicable only to exceptional conditions. The reason for this is the greater first cost of such equipments. This is especially true when comparing single-phase with direct current. The type of equipment used on the rolling stock may well be a more important factor in the economy of investment and operation than the scheme of power distribution.

11. Under the conditions which exist in North America, direct current and single-phase are applicable to either level or grade work; while three-phase will probably be limited to the latter where its regenerative feature of returning energy to the line may be of value. The relative economy of the different systems of electrification is dependent on the density of traffic and the character of power available, rather than on the length of the railway.

12. In cases where purchased power is used, or is depended on as a reserve, the frequency of the current supplied by the power company will have a bearing on the cost of sub-stations, and will thus affect the choice of the system. For direct current operation, rotary apparatus is used for converting the alternating into direct current, and the frequency of the supply is therefore relatively unimportant. For single-phase operation under the usual conditions, a frequency of not more than 15 cycles is desirable; and to provide this frequency, rotary frequency changers are as necessary as are rotary converters in the case of direct current, since the frequency of existing power companies ranges from 25 to 60 cycles.

13. With power supplied at the proper frequency for single-phase operation, permitting the use of static transformers and dispensing with frequency changers, the amount of energy required for a given trunk line service is in many cases nearly the same as for direct current, the greater weight of the equipped rolling stock, and the lower efficiency of the single-phase equipments, offsetting the rotary converters and trolley line or third rail losses of the direct current.

14. The principal conditions which determine railway equipment are:

(a) Profile of road.

(b) Transportation required, i.e., weight of trains or seating capacity of cars.

(c) Frequency of trains.

(d) Length of individual runs or distance between stops.

(e) Schedule required.

(f) Lenth of railway to be electrified.

15. In the selection of the electrical system best adapted to a particular set of conditions there are three items to be considered: (a) sub-stations, (b) contact conductors, (c) rolling stock. A comparison of these items determines the relative economic values of the systems.

16. I will consider briefly the effect of changes in the items given in paragraph 14:

(a) Profile: From a level country to a limiting grade of 1 to 1½ per cent. there will be little difference in the relative values of the systems. With steeper grades the conditions will be more favorable for alternating current.

(b) Traffic requirements: Heavy individual train units favor the alternating current system with exception of the locomotives; light trains or multiple unit operation favor the direct current system.

(c) Frequency of trains: Infrequent service with a relatively small number of locomotives favors the alternating current; frequent service the direct current. With increase in number of trains, the direct current systems gain relatively faster than the alternating current in economy of operation, due to relatively decreased sub-station operation, increased sub-station efficiency, and lower cost of equipment maintenance. It is therefore well to consider what the ultimate traffic density may be and select the system best suited to meet these requirements.

(d) and (e) Distance between stops and schedule required: Variations in these will not affect the relative value of systems unless extreme requirements, such as high schedule speed with short runs, make the use of direct current imperative.

(f) Length of road: For a similar character of service throughout, the railroad may be of any length without affecting the relative desirability of the various systems. What is suitable for the first fifty miles will be equally suitable for any extension.

An examination of these variables will show that a change in the conditions to be met will radically change the relative economic value of the systems of electrification.

17. The single-phase system, by reason of the apparent simplicity of its elements and the utilization of higher potentials for the contact conductor than is possible with the direct current, is admittedly very attractive. There is the other side of the question that the single-phase commutating motor is much higher in first cost and maintenance than the direct current motor. Over this subject of alternating current single-phase vs. direct current systems there has been a great deal of controversy. It is my opinion that comparative results obtained up to the present time are in favor of direct current.

18. Desirable as would be a standard system for all classes of service, we cannot hope to establish such a standard should it impose an additional expense without adequate return. A summing up of all the elements of each electrical system is most desirable to meet specific conditions. For trunk line service a higher potential than 600 volts will unquestionably be used; 1,200 volts direct current will prove economical in some cases, but a still higher voltage is required to provide economically for the heavier intermittent service. Whether this potential will be 1,800 or 2,400 volts direct current or 11,000 volts alternating current cannot be settled arbitrarily.

Interurban Railways

19. Let me consider the interurban railway situation in the United States, particularly in regard to the various available schemes of electrification. These are, 600 volt direct current, 1,200 volt direct current, and single-phase, the three-phase being objectionable on account of the complications of the necessary double overhead distribution system.

20. The application of single-phase to new projects has been practically abandoned, there having been but one or two new installations in the last three years. This arrested development of a system which for a short time held forth considerable promise, has been brought about by a general recognition of its limitations. Experience has shown these to be:

(a) Excessive weight of rolling stock.

(b) Excessive cost of rolling stock.

(c) High cost of equipment maintenance.

(d) Increased power consumption.

(e) Rapid depreciation of motor.

(f) Rapid depreciation of car bodies and trucks.

(g) Increased cost of maintaining track and roadway.

Moreover it is recognized that any interurban road in the United States must be capable of operating over existing city tracks from 600 volt direct current trolley, a condition which hampers the single-phase system on account of increased complications in the control system.

21. For interurban railways a potential of 1,200 volts direct current has been selected, because with the motors wound for 600 volts the car may be operated at the same speed from either 600 or 1,200 volt trolley, by connecting the motors all in parallel for 600 volt operation, and two in series with two groups in parallel on a 1,200 volt section

22. A general comparison of the different systems as applied to an interurban road, is given in the following tabulation:

	600 Volt D.C.	1,200 Volt D.C	6,600 Volt A.C.
Generators	3-phase	d.c. or 3-phase	3-phase, operating single-phase at about 66 per cent. full 3-phase capacity.
Transmission	3-phase with step-up transformers	d.c. 1,200 volts or 3-phase and step-up transformers.	Single-phase direct or with step-up transformers.
Sub-stations	10 to 14 miles apart. Contain step-down transformers and rotary converters.	20 to 35 miles apart. Step-down transformers and rotary converters.	25 to 50 miles apart. Step-down transformers, motor generator sets, frequency changers.
Trolley Conductor	Third rail or trolley.	Third rail or trolley.	catenary trolley high tension insulators.

While comparing favorably with single-phase a.c. in the cost, operating expense, and reliability of the generating and distribution system, the superiority of the car equipment of the 1,200 volt system gives this system a most pronounced advantage. The importance of this feature cannot be over-estimated.

The 1,200 volt car equipment contains no radical departure from 600 volt practice, in design, construction or

arrangement. The motor has the same rugged structure, the same capacity for overloads, and the same long life of bearings and brushes as its most successful prototype, the 600 volt motor. The control and auxiliaries are almost identical with a standard 600 volt equipment, with the addition only of the dynamotor, which in actual practice has proven to be thoroughly reliable and economical. The motors may be wound so that each will operate directly on 1,200 volts when in parallel, or so that two will be in series when at full speed. In the first case only half speed can be obtained on 600 volt sections; while with the second arrangement, half speed, or, by paralleling the motors, the same car speed as on 1,200 volt, can be had on 600 volt sections. Both arrangements are in use, but in most cases two motors in series are preferable.

23. There will be an additional cost of operation and maintenance with the single-phase system for the items of track and roadway, due to additional weight of cars, car shop expenses in providing greater facilities for shop inspection and repairs, and greater skill in superintendence of equipment. In a number of instances this has been found to amount to several cents per car mile. A conservative estimate would require at least one cent per car mile to be added for these items.

24. A comparison between the two systems brings out the fact that even for conditions selected as favorable to the single-phase system, the 600 volt direct current system is the more economical considering operation, maintenance and fixed charges. An examination of the elements which enter into the first cost and operation of a system will show at once that as the density of traffic increases there is a rapid gain in the relative advantage of the direct current over the single-phase system.

25. The saving effected by the 1,200 volt direct current system is so marked that a great increase in the adoption of this potential for this class of interurban railroading may be anticipated, and on the other hand it will not be surprising if the single-phase interurban system is entirely discarded in America, unless some improvement is made in the art and a more economical equipment made available. There is no question regarding the mere movement of trains by any particular system—this may be taken for granted. The study of electrification is really a problem in economic engineering and not simply a technical problem.

Relations between Capital and Labor

A short discussion of the reasonable attitude of Capital to Labor and vice versa—Mutual Confidence a strong factor

By Mr. Donald S. Barton

To any individual interested in Street Railway operation there must always be present the two big divisions into which such operations are divided, i.e., Capital, and Labor. To the majority of individuals interested in street railway operations either one or other of these divisions is to them of paramount importance, and really very few try thoroughly to comprehend the details in which one or other may be varied to the advantage of the other.

Capital may be considered as the reserve of past experience and other operations.

Labor may be considered as the operations of the present.

The Directorate as the exemplification of the hopes of the future.

These three divisions should be firmly bound together to form an operating combination to accomplish one aim, i.e., adequate transportation for the general community proposed to be served to the general benefit of Capital and Labor and the general good.

Capital has three facts to bear in mind, these are:

(1) The fair value of purchase to be given;

(2) The fair value of interest to be received;

(3) The fair amount for depreciation to be provided.

Labor has three facts also to remember:

(1) Fair share of labor and mental service for wages to be given;

(2) Fair share of profits of operation to be received;

(3) Fair share of reserve for service to be provided.

Capital properly invested in an enterprise becomes as a rule mortgage on the properties of the company, fair allowance being made for interest and depreciation unless sinking fund is provided to pay it back in future.

Labor remains in full control of its own Capital.

Labor, manual and mental labor, once the strength of manhood has left the body or mind, becomes worn out and is sooner or later discarded as useless or antiquated capital.

It is apparent that to Labor the body and mind are as much Capital as the money commonly known as Capital, and interest for the present, and depreciation for future must be considered by Labor as in the case of Capital.

Manual service is open to the competition of manual labor and of mechanical service, and its basis of value is so obtained, and by care resulting in skill, and perseverence becomes a Capital asset large or small.

Mental service is open to the competition of knowledge, and by study and experience becomes a Capital asset large or small.

Each one therefore has his Capital whether —

As Capitalist so called: money, brain, and manual strength.

Labor so called: manual strength, brain, and money.

Professional man so called: brain, manual strength, and money; and it is only a question of relative proportion.

And each should study to utilize his Capital for the greatest general good. Then how is he to establish in his mind, where the greatest good may be done. Money is the measurement of the results only in human coin. Happiness is nature's reward. Few men, comparatively, are called upon to provide in a large way for the good of the general public, and these are as a rule men who have already done something for good in smaller circles of life.

Capital and Labor are only comparisons of the same thing.

How few men start out in life to accomplish an object. Most men first say "what money can I get?" and the result is that money and not accomplishment of a purpose becomes often the ruling factor. Pay day is the goal, and all pleasure in work or accomplishment is lost. Capital is usually invested with a purpose to accomplish. Labor in many cases is only invested with a purpose to receive.

In these few short remarks, I do not wish to pose as a preacher, but mention them to lead the train of the readers' thoughts, to the main point of this short article, "How can Labor help Capital, and how can Capital help Labor, to the

mutual benefit of all concerned?" Capital once invested is much more the real servant of the company than the so-called employee. Capital has staked its all in the enterprise. The employee is free to go and come. Capital must wait for results. Labor is free to wait or move off. Labor is continually struggling to subject. Capital must remain the butt.

While uncertainties remain in the labor situation, Capital will naturally strive to fortify itself against Labor by automatic processes, and by reducing the amount of labor to a minimum quantity. Every additional rise in the rate of pay to ordinary labor naturally does more to introduce machinery and labor saving appliances, and the public generally find living cost increasing, and the benefit naturally goes to the producer of raw material, or the man who helps to create and without whom operations would cease.

If instead of continually striving to get increased wages the labor unions would strive to reduce the cost of living, they would materially benefit themselves, and the community generally.

Increased wages means general increased cost of living, and every increase of cost of production gives extra value to all properties owned by capital, and eventually defeats the very object desired by the parties demanding increased wages for the same service, i.e., the capacity for greater comforts. Take one example: Why should the common Street Railway fare be five cents, practically in all places, and for all distances in Canada? Is there any sense in this arrangement? Certainly not! You see every moment in this country, people hurrying along streets for short distances and street cars passing them practically empty. Why? because the fare is five cents for five minutes, as for fifty minutes, and Capital will say if you ask them to make variable fares for variable distances, "we cannot get labor to do it at a reasonable price," and so labor in this instance is robbing the public of a convenience which would cost them nothing but a little additional attention.

Should the conductor who sleeps leaning against the rear partition of his car expect to receive the profits of enterprise in the undertaking, or the motorman who carelessly runs his car receive the profits of benefiting the company?

Capital and Labor must work together for the benefit of each and the general welfare of all.

Nothing will help Capital more in this relation than the confidence of Labor that Capital desires to deal fairly; the same applies to the relation of Labor to Capital, and how is this to be established otherwise than that every dealing made by either party with the other should be decided on a question of justice, carefully, thoroughly and generously.

Now let us consider this one point, i.e., how to establish confidence between Capital and Labor, and see what are the steps.

From—(1) The Company to the Manager;
(2) The Manager to the staff;
(3) The staff to the foreman;
(4) The foreman to the men;

and what are the conclusions Necessarily each one member of a company is to a certain extent personally able to help to bring about the proper understanding between Capital and Labor to the well-being of the community at large, and therefore let each one of us try and do his share.

Alternating Current in Railway Operation

A strong argument for Single Phase—Local conditions must be considered—Three Phase adapted for through traffic

By Mr. F. R. Dimock

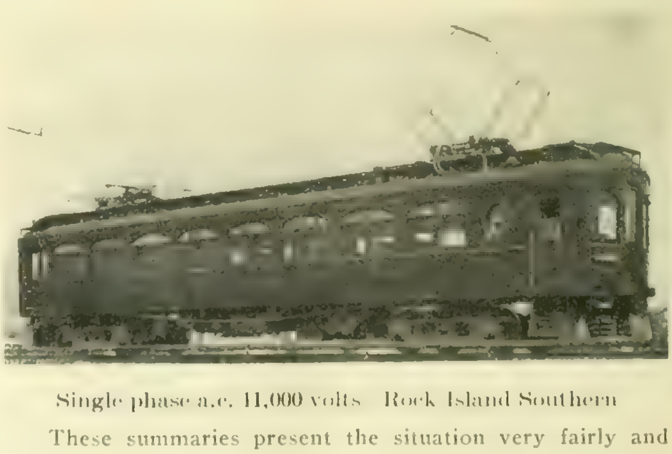
There has been of late years so much partisan advocacy of differing electrical systems that many practical railroad men, and electrical men also, might well become confused and wearied by the contentions. In advertising the fact that it furnishes railway equipments of all kinds, a great electric company recently published a concise and interesting summary of the characteristics of the three great systems of railroad electrification. Each system has characteristic features of advantage for particular conditions.

1. The direct current system was the first in the field and has advantages in the operating characteristics of the motor; simplicity and ruggedness with high power, variable speed and ease of control. The limitations of the system are found in comparatively high cost and low efficiency of the transmitting and distributing system and in conversion losses, especially in systems designed for moving heavy trains over long distances.

2. The single-phase system gives operative qualities similar to that of direct current, with somewhat greater flexibility as to power and speed. The first cost of the transmitting and distributing installation is comparatively low and great economy for hauling heavy trains over long distances is secured. The motors are similar to direct current motors and may be operated on direct current if necessary; but this requires additional, heavy and complicated control. The first cost and weight of single-phase rolling stock equipment is somewhat higher than that of direct current apparatus. The limitations of single-phase operation have not yet been determined

3. The three-phase system is adapted for roads where constant speed in uninterrupted hauls is economical. The practically constant speed operation of the three-phase motor is against its use on main line railways where variable speeds are required. Two overhead trolley wires increase the cost of installation and cause complications.

In choice between the three systems in America, local conditions should be considered.



Single phase a.c. 11,000 volts Rock Island Southern

These summaries present the situation very fairly and should emphasize the fact that the most advanced electrical manufacturers urge no particular system other than the one that is, in each instance, most economical. Economy of installation and operation, together with provision for fu-

ture development, should be the determining factor in selection of railway apparatus.

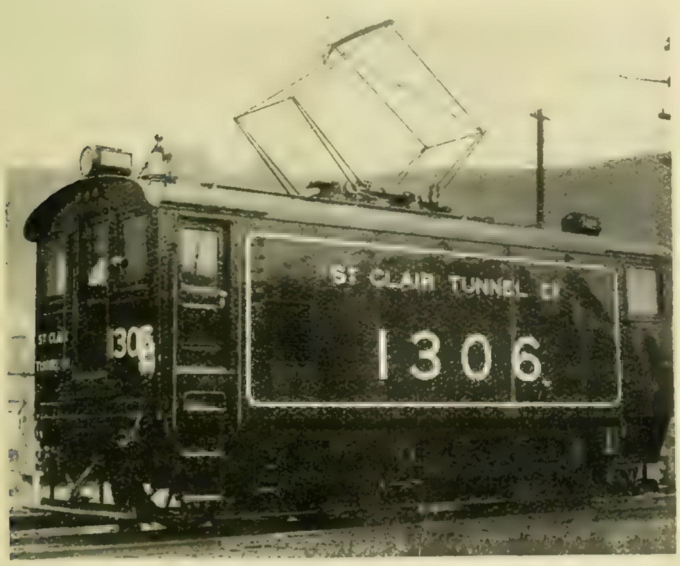
Generation and transmission of power for railway service in the form of three-phase alternating current is too thoroughly established to need discussion here; but the inevitable growth of central power plants and the certainty of arrival of the time when great central stations will supply power for trunk or main line railroads, and interurban and local lines, together with current for industrial and lighting purposes, must now be considered by every one interested in railway electrification.

This condition is now especially acknowledged in France, where certain tramway companies are now suffering from inadequate electrical equipment and cheap construction. Owing to high mintenance charges and the reduction in the cost of power from large central stations, several railroad systems have found it economical to shut down their generating stations and purchase current from central station plants.

Purchase of power for railway operation is a present practice in several localities in the United States to-day, but it is only in its infancy. Its inevitable advent will largely eliminate individual power plants for local railroads, with their poor load factors and consequent costly operation, and greatly simplify and stimulate new railroad lines or extensions. Under the well established principles of generation the problem of selection of equipment becomes one of economy of transmission, distribution and operation, considered as a whole.

Single-phase Operation

Three-phase railway operation may be considered as suited for certain conditions in main or trunk line heavy service only; and for the purpose of this article, the scope of alternating current in railway service will be considered as applying to single-phase operation for both passenger and freight service on interurban lines, local systems serving a comparatively wide territory, and main lines.

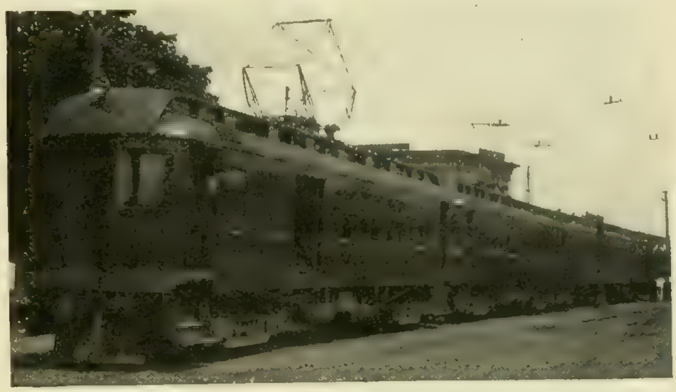


Single phase, 3,300 volts—St. Clair Tunnel

Single-phase alternating current operation has greatly extended the profitable field of electric motive power. It is especially adapted to handling passenger and freight trains (heavy or light) over long distances and to interurban service with either single cars or multiple unit trains. It is only under exceptional circumstances that it may, at present, be considered economical for street railway operation in the compact distribution systems of cities and towns.

Transmission and distribution of energy from power plants to moving cars or trains by the single-phase system is simple and economical, and a high efficiency is obtained.

The first great economy of single-phase system is in the first cost of installation, whether power be generated or purchased. The first cost of rotary converters and intermediate feed wires is dispensed with, and a further saving is effected in first cost of sub-stations. Instead of comparatively large buildings at frequent intervals, the single-phase system requires only small sub-station buildings at long intervals. These need be nothing more than shelters for transformers and in many cases outdoor transformers may be used.



Multiple Unit train, 11,000 volts—Erie Railroad

The second great economy of alternating current operation is found in the item of fixed charges and operating costs. Since the first cost of apparatus and installation is lower than for direct current, the items of depreciation, interest, taxes and insurance are less as a direct consequence.

In operating expense the first saving apparent is that of attendants at sub-stations. The moving machinery required for conversion to direct current requires constant attendance, with day and night operators; while the alternating current transformers, whether sheltered or standing outdoors, require little attention other than visits at convenient intervals.

In the matter of power consumption, the records obtained from a number of operating companies show that the kilowatt hour requirements per car mile are considerably lower for single-phase equipment than for direct current equipments operating cars of the same general dimensions and design, under similar conditions from a sub-station fed trolley.

The first cost and weight of single-phase rolling stock equipment is somewhat greater than that of direct current apparatus and the maintenance charges are somewhat higher, but the savings in first cost of the complete electrification, fixed charges and operating expenses far over-balance these considerations.

From an operating standpoint the single-phase system has numerous favorable features. It is capable of the highest speed (in fact, untrained motormen are apt to far exceed the scheduled rate) and yet the speed control is entirely flexible and unlimited. Any amount of power can also be used.

An important feature of advantage for interurban roads and main lines is its adaptability for multiple unit train operation. A single-phase system laid out with the minimum copper and sub-station requirements can operate trains of many cars. Among numerous instances it may be mentioned that the Chicago, Lake Shore & South Bend Railway, recently operated an 11-car train, made up of six motor cars and five trailers, for a distance of more than 60 miles over its line without interfering in any way with the regular service maintained. A number of the single-phase roads now in operation regularly operate trains of from

two to five cars without having found it necessary to add any feeders to the overhead line as laid out for single-car operation.

Another advantageous feature is found in the voltage step control of single-phase equipment, in which every speed is an efficient speed. A fact not widely known, and one that should be appreciated in Canada, is that this control renders the equipment much better adapted for bucking snow than the direct current resister equipped car. Last winter the Glen Cove single-phase line of the Long Island (N.Y.) railroad was reported as keeping its schedule when all direct current lines on Long Island were badly tied up in a heavy snow storm. All single-phase lines report less trouble than others in snow storms and one report from the Chicago, Lake Shore & South Bend Railway mentioned that its cars actually made up in time bucking snow.

Partisan opponents of single-phase operation have frequently asserted that it was unsuited to heavy service, and a paper read last summer went so far as to assert that single-phase projects were practically abandoned in America. It was an amusing coincidence that this paper came out just before the Boston & Maine Railroad signed contracts for the single-phase electrification of the Hoosac Tunnel, and that at the same time the New Haven interests ordered additional Westinghouse single-phase locomotives. The New Haven had also, after three years of trial, placed contracts for single-phase electrification of its Harlem river division and has planned to extend single-phase electric operation to all traffic over the whole division between New York and New Haven. At the same time, also, equipment was being built for an entirely new single-phase interurban

Two motors, five trailers—a.c., d.c. control, 11000 volts, New York, New Haven and Hartford R. R.

line in Illinois (the Rock Island Southern); other single-phase roads were increasing their equipments, while Canadians should be familiar with the thoroughly satisfactory operation of single-phase apparatus in the St. Clair Tunnel, where all of the traffic of the Grand Trunk Railway has been handled electrically for nearly three years.

Recent information announces that, after exhaustive investigation of electric systems, the Prussian government has adopted single-phase motors with an aggregate rating of 1,900 h.p. and a speed of 74.4 miles per hour for the standard electric locomotive for trunk line service. The Vienna-Pressburg and another Austrian railroad are now to be operated with 15 cycle, 10,000 volt, single-phase current as will be the Rhatisch Mountain Railroad in Switzerland.

From lists recently published in the Elektrische Kraftbetriebe und Bahnen of single-phase railways equipped by two of the German manufacturing companies it appears that these companies have equipped thirty-two railways with 433 single-phase locomotive or motor cars of an aggregate horse power of 206,145, which surely indicates progress. In England the South London Elevated Electric Railway, nine miles in length, was equipped with the single-phase system and put into operation December 1st, 1909. Its report for the first six months of 1910 shows the enormous increase of 91 per cent. in passenger traffic, and the company is reported to be planning immediate similar equipment of two additional sections in populous districts.

In France, the Midi Railway is now equipping some one hundred and fifty miles of double track on the single-phase system and a few tramway lines are giving it a trial.

Full particulars as to all single-phase railways in America are not at the moment available, but the following is a partial list with some details recently obtained from the Westinghouse Company:

ROAD	Miles of Road	Trolley Voltage Cycles		Schedule Local-Exp.		Class of Service
Chicago, Lake		800	25			Freight and
Shore & Bend Ry.	76	6600	25	33	65	Int. Pass
Denver & Intr. Ry.	54	550	d.c.			
		11000	25	30		Steam R.R. Pass
Erie Railroad Co.	34	11000	25	26		" " "
Ft. Wayne & Springfield	21.6	6600	25	26.5	45	Int. Pass & Frt.
Grand Trunk Ry. St. Clair Tunnel	3.7	3300	25	10		Steam R.R. Frt.
Hanover & York St. Railway	18.58	6600	25	26		Int. Pass & Frt.
Indianapolis & Cincinati Trac. Co.	108	3300	25	37	47.7	" " "
Long Island R.R.	4 85	2200	25	28		Suburban Pass
Maryland Elec. Ry.	24.93	6600	25	3[illegible]		Steam R.R. Pass
N. Y., N. H. & H. R.R.	34	11000	25	26	60	" " "
Pgh & Butler St. Ry.	38	6600	25	2[illegible]	50	Int Pass & Frt.
San Francisco Vallejo and Napa Valley R.R	33.84	3300	25	23	54 5	" " "
Spokane & Inland Empire R. R. Co.	130	6600	25	21		Steam R.R. Frt and Pass
Visalia Elec. Ry.	22 2	3300	15	31	62	" " "
Rock Island & Southern Ry.			25			Int. Pass & Frt.

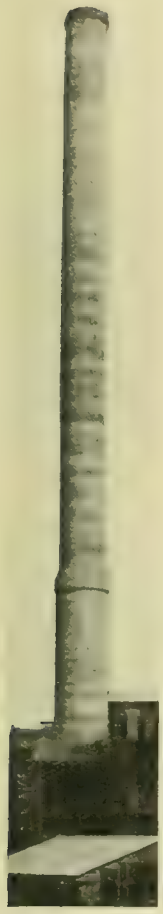
Single-phase Motors Operate D.C.

Since the single-phase alternating current series motor operates equally well on direct current, some railways have cars and locomotives equipped with control apparatus for both systems, and direct current trolleys or third rail shoes, in addition to the single-phase pantagraph trolley. This arrangement was at first considered to be favorable for single-phase roads, since it permits operation through city streets and elsewhere over the tracks of connecting direct current roads, and at the same time secures single-phase economy for the main line, but its application has restrictions. On main line railways, where terminal connections render provision for both forms of operation imperative, it is perfectly practicable. This is fully shown in the successful operation of the New York, New Haven & Hartford Railway, which is obliged to enter the New York passenger terminal over twelve miles of direct current electrified line; but where it is not essential it is undesirable and should be avoided. Provision of double control equipment increases first cost and adds materially to the weight and to the maintenance charges. In some instances where it has been attempted on interurban roads with city connections, the weight of the cars has been found detrimental to ordinary tracks in city streets, with a resultant condition of understrains on the cars and equipment; but it has been amply demonstrated that single-phase operation over suitable tracks through city streets is entirely satisfactory; and when interurban roads have their own lines through or into cities and towns, local and through conditions are equally well served.

The practical success of alternating current in railway service is now thoroughly proven in so many installations in the United States and abroad that it must soon become familiar to many who have been opposed to its use. Its scope includes practically all of the railway field in which length of line is greater than the few miles which can be economically served from direct current converters.

Electric Railways and Railway Men

British Columbia Electric Railway



250 ft. Tower

At the end of 1910 this company had in operation about 163 miles of city and interurban lines, or including double tracks and sidings a total trackage of about 205 miles, 70 miles of which were opened for traffic during the year. This includes about 50 miles of city and suburban lines on the mainland, 100 miles of interurban, and 13 miles of city and suburban lines at Victoria, on Vancouver Island.

On the mainland the company's lines cover a territory approximately 80 miles east and west by 20 miles north and south.

Of the city lines 35½ miles of routes are in Vancouver city and suburbs, and included in the interurban lines is 25 miles of C. P. R. track extending 15 miles south from Vancouver to Steveston, and a branch of 10 miles along the north arm of the Fraser between Eburne Junction, on this line, and New Westminster city, giving an alternate interurban line. The old line 12 miles long, between the two cities, has now been double-tracked for 6½ miles, and from a point a short distance from there a new line is to be built which will avoid the present heavy grade at the entrance to New Westminster, where the line drops over three hundred (300) feet in less than a mile, with a maximum grade of ten per cent. When completed the interurban line will have a maximum grade of only 2.7 per cent., although it reaches an altitude of over 500 feet about half way between the two cities. It is worth mentioning in passing that this is about the oldest interurban line in Canada, having been opened for traffic by the old New Westminster-Vancouver Tramway Company, of which the late David Oppenheimer was president, in September, 1891.

The greatest event in the year was the opening for traffic of the Fraser Valley Branch, early in October. This line crosses the Fraser river at New Westminster on the fine new government bridge, then runs over a private right-of-way over the hill through virgin forests, and through the choicest prairie, farm and fruit lands in the Fraser Valley to Chilliwack, a distance of 64 miles from New Westminster.

The road is well graded and ballasted, and laid with seventy pound rails, and is a very smooth track for so new a line.

The service at present consists of two (three or four-car) multiple unit express trains daily each way, and a local passenger and milk express from Huntingdon to New Westminster, forty-two miles, also daily. All these trains make direct connection with the interurban cars from Vancouver at New Westminster, so that the run from Vancouver to Chilliwack, seventy-seven miles, is made in four hours. This schedule will probably be reduced when the roadbed is in a more finished state.

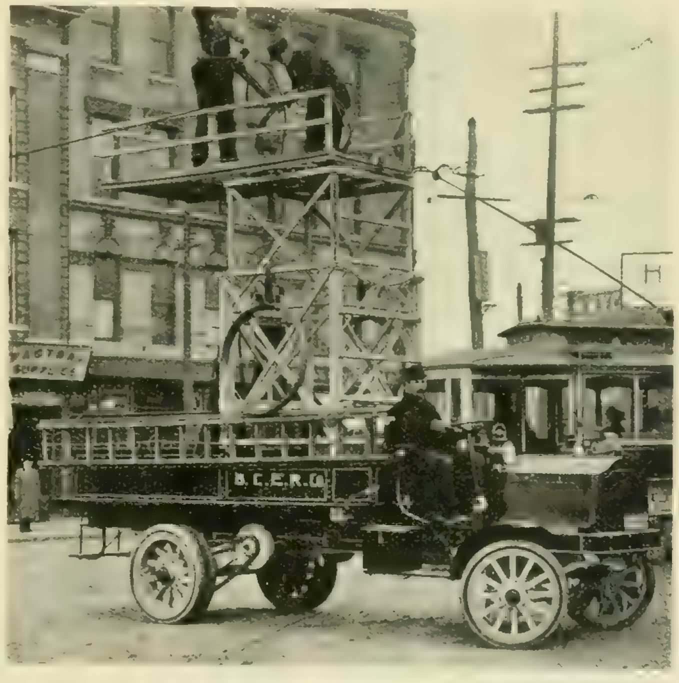
Power is supplied to this line by two transmission lines running along the right-of-way, and through five sub-stations besides the one at New Westminster to overhead trolley at 630 volts.

The passenger and express cars are 55 feet overall, the passenger cars seating 60 persons and elegantly finished in mahogany, with high-backed roll-top seats, smoking compartments, toilet rooms, etc., and train vestibules. Each car is mounted on Brill 27-E-3 trucks with 34-inch steel-tired wheels, 6-inch axles, and driven by four G. E. 204, 75 horse power motors, with Sprague-General Electric multiple unit control. The trains are also equipped with Westinghouse automatic "A.M.M." brake system and pneumatic train line signals, Tomlinson Radial M.C.B. couplers and carry all the standard railroad signals and markers.

The present equipment on this branch comprises three baggage express cars, four combination passenger and baggage cars, and two passenger cars, while three baggage cars, and three passenger cars are under construction in the company's shops.

The traffic on the line has already taxed the present equipment to the limit, and an express and mail service has been inaugurated.

To handle the freight business one through train daily each way is run between Vancouver and Chilliwack via Eburne. These trains are equipped with four-wheeled ca-



B. C. E. R. New Over-head Construction Car

booses, and are hauled by fifty-ton, 640 horse power Dick-Kerr locomotives, of which the company at present have three in service. These locomotives are very powerful, and can handle heavy trains with ease, up to the full capacity of the power stations on the line.

To handle the freight business on the interurban system generally, in addition to a large number of C. P. R. or other cars for points beyond the company's system, there have been built or purchased 100 box cars, 12 stock cars, and 170 flats, the latter including twenty-five forty-ton, forty-one feet logging cars, and the present business offering indicates that this equipment will have to be increased in the near future.

Service on the two interurban divisions has been maintained by half-hourly cars each way, there being eighteen

50-foot standard 54-passenger cars, and at present ten 45-foot cars built by the Preston Car and Coach Company are being equipped.

When present plans are completed all these cars will also be equipped for multiple-unit operation.

For the freight and express business on the interurban lines, the company has three 30-ton, and four 25-ton locomotives, and four 50-foot express motor cars. One of the 50-ton locomotives before mentioned is employed exclusively in delivering cars to various industries on electrified C. P. R. tracks in ths city, handling and switching an average of over thirty cars daily, over three miles of track, fed by several large sawmills, etc.

In Vancouver the Pay-As-You-Enter car has come to stay, sixty-three of the 118 cars being of this type, most of which are built at the company's shops in New Westminster. To accommodate the rapid increase in traffic a rush order for thirty single-end pay-as-you-enter cars was recently placed with the American Car Company, St. Louis, to be delivered in March. These cars will be of Brill semi-convertible type, with large rear platforms, divided for entrance and exit similar to the Montreal cars, and exits at front ends.

Including Victoria, North Vancouver and New Westminster city lines, a total of 167 passenger cars are in service. The company also operates two handsome observation cars similar to the Montreal ones, one in Vancouver and one in Victoria.

The power for the whole system on the mainland is supplied from the Vancouver Power Company's hydro-electric plant of 32,000 h.p. at Lake Buntzen, on the north arm of Burrard Inlet, fifteen miles from Vancouver, from whence it is distributed over 200 miles of transmission line to thirteen sub-stations.

At Vancouver there is an auxiliary steam plant of 8,000 h.p. for contingencies, but as all the transmission system is duplicate, very little interruption is experienced to the power service.

The most interesting station is in Vancouver, where the railway is fed from the two largest 60-cycle rotary-converters in existence. These are 32-pole, six-phase, 2,000 kw. rating each, with armatures 14 feet in diameter, and give excellent service. They were built by the Canadian General Electric Company.

From all of the sub-stations the company has extended a network of light and power lines, which follow the railway and branch off into the newly opened country to light the village store, or the farmer's house, and also to operate all kinds of machinery from a churn to a portable saw-mill.

A photograph shown herewith represents a new chimney recently built for the British Columbia Electric Company, by the Weber Chimney Company, of Chicago. The total height of this chimney is 246 ft. 6 in., inside diameter 11 ft., foundation 29 ft. square. The lower 80 ft. of the chimney consists of a double shell, the outer shell being 8 inches thick, and the inner shell 4 inches thick with a 4-inch air space between. Above this double shell the chimney consists of a single shell 6 inches thick.

The concrete in the foundation of the chimney consists of one part Portland cement, 3 parts clean sharp sand, and 5 parts gravel. The concrete in the shaft of the chimney consists of one part Portland cement, 2½ parts clean sharp sand, and 4 parts crushed stone. The foundation is reinforced with four horizontal networks of steel bars, the two lower networks being laid diagonal to the sides, and the two other networks parallel to the sides of the chimney. The vertical bars of this reinforcement reach down into the foundation and thereby form a perfect anchorage for the shaft of the chimney. There are also horizontal rings placed in the shaft every 18 inches. The chimney is designed to be capable of withstanding pressure due to a wind velocity of 100 miles per hour, and a temperature of 1,500 deg. F.

The company has also recently placed in commission a motor truck manufactured by the Packard Auto Company, of Detroit. This truck is designed for overhead construction and repair work. It is of the 3-ton type, with a folding tower. An elevated platform swings on a pivot to facilitate operatons aloft. The special body was built by J. R. McCardell & Company, of Trenton, N.J.

The general manager of the British Columbia Railway Company is Mr. R. H. Sterling, with Mr. F. R. Glover and Mr. W. H. Hope, assistant general managers.

Mr. W. T. Woodroofe is superintendent of Mainland branches with Mr. Lloyd as assistant. Under this department is included the maintenance and operation of power plants, sub-stations, transmission lines, all overhead lines for railway, light and power purposes, and all construction and equipment and maintenance of all rolling stock, car barns, etc. Mr. D. R. Kennedy, formerly superintendent of the power house at Lake Buntzen, is now superintendent of transmission. Mr. Vorce is chief engineer. Mr. A. Purvis is superintendent of interurban lines. Mr. G. Dickie is master mechanic. A new official has recently been added to the ranks of this company in the person of Mr. G. R. G. Conway, consulting engineer.

Montreal Street Railway

The history of the Montreal Street Railway Company dates from May 18th, 1861, when the Provincial Legislature adopted a law incorporating the Montreal City Passenger Railway Company "for the purpose of constructing and operating street railways in the city and parish of Montreal." Work was started in September, ground being broken on the 18th for the first line. By November 27th part of the line was sufficiently advanced to be opened. The road met with immediate success although, horses being employed as the motive power, the service was slow and somewhat irregular.

At a meeting held on November 5th the company's stock books were ordered closed, 2,500 shares having been subscribed for at $50 a share, representing a capital of $125,000. The following year another line was constructed on Notre Dame street and equipped with three horse cars. In June of this year the company declared its first dividend of 12 per cent. per annum. In July the company terminated the lease with the contractor who built the road and took over the operation of the same with considerable profit. At this time the head office of the company was in a small building at the corner of Craig street and Place d'Armes. In 1894 the present Street Railway Chambers were erected on this site.

Only a day service was furnished at that time and even in those early days the lines on Craig, St. Antoine and Notre Dame streets were very well patronized. New lines were rapidly added on additional streets so that by 1863 the company carried over a million passengers within the year, which was considered an excellent record. In 1864 with about six miles of tracks the company carried 1,485,725 passengers. The winter service was kept up by sleighs. The company had eight sleighs at that time, while five more were being built. None of the cars were heated in those days and the passengers were obliged to bury their feet in pea straw as the only method and the regular custom of keeping the feet warm.

By 1892 the total trackage of the company amounted to only 12½ miles and the company was then operating 82 regular sleighs during the winter season. This year, however, marked the most important period in the company's history, the beginning of the electric era. So strong was the opposition to the proposed electrification of the system

that some of the directors resigned as a protest against the project. The conversion of the system into one operated by electricity was difficult owing to climatic conditions. The snow fall was nearly always heavy, averaging for many years 118 inches and reaching as much as 14 feet in one season. Another difficulty was the heavy grades, amounting in some places to as much as 11 per cent., but these difficulties were gradually overcome, and the electric system proved a great success in spite of all obstacles.

In 1901 this company purchased all the bonds and a majority of the stock of the Montreal Park and Island Railway Company. In the same year the company secured franchises from the towns of St. Louis and St. Paul, both now wards of the city. In the following year the company issued $1,500,000 of 4½ per cent. bonds to pay for the Park and Island Railway. The capital at this time was $6,000,000. Fourteen miles of new track were at once built and put in operation. In the following year the company secured an extension and bought considerable property for building purposes.

In 1906 the company entered into an agreement for the purchase of the stock and bonds of the Montreal Terminal Company and also secured a franchise in Outremont. The purchase was concluded in the following year. The Park and Island Company also secured a franchise in Notre Dame de Grace and started an extension of the Sault-au-Recollet line to opposite St. Vincent de Paul.

At the present time the total single track mileage is 144¼ miles, in addition to which should be added 86 miles operated by subsidiary companies, making a total of 230 miles under the control of the street railway directorate. Legislation was secured at Quebec recently authorizing the amalgamation of the Montreal Street Railway Company, the Park and Island Company, the Terminal Railway Company, and the Public Service Corporation. The steps necessary to the union of these companies are now under way and the prospects are that very shortly a new contract will be made between the Montreal Tramways Company which will be the name of the new corporation and the city, and with other suburban municipalities which have the right to negotiate for franchises.

In 1892, when the company started operating by electricity, it had only one power station on Cote street. In 1894 a big power station was completed on William street. In 1901 five thousand h.p. was purchased from the Montreal Light, Heat & Power Company and corresponding machinery installed, making a total of steam and hydro-driven electric power of 11,275 kw. The company's next move was to contract for 2,000 h.p. from the Shawinigan Falls Company. This was delivered in 1905 and another thousand h.p. was contracted for in August, 1906. In the latter year two steam sub-stations were built, one at St. Henri and the other at St. Denis. In 1907 another new steam power house was erected on Notre Dame street east.

The present power capable of development by the company for its cars is 21,013 kw., being 11,400 kw. generated by steam, and 9,613 kw. by water power as compared with 1,200 kw. in 1892. The standard for the entire system is 600 volts, direct current. Induction motors are operated by hydro-electric power, alternating current, at 2,200 volts. The company now receives hydro-electric energy from Shawinigan Falls, Lachine, and Chambly, in addition to its extensive steam power plant.

The most modern cars now being turned out are 51 feet long or three-quarters of the length of the best railway cars. They are built almost entirely of steel on double trucks just like steam railroad cars. Both ends are vestibuled, which adds greatly to the comfort of the crew. They are brilliantly lighted and equipped with electric push buttons to signal stops; they are furnished with electric heaters which preserve a comfortable temperature in winter. Open cars make travelling pleasant in summer.

All new cars are equipped with circuit breakers which render delays from burnt-out fuses very rare. Practically all cars are furnished with air brakes.

The adoption of the pay-as-you-enter principle on passenger cars has greatly simplified the collection of fares. In 1892 there was an average of eight cars in the service. At the present time the company has nearly 600 cars running in their daily service, over 400 of which are of the pay-as-you-enter type. This style is being adopted as fast as possible, the most modern cars replacing the old-fashioned coaches in large numbers every year.

The Montreal Park and Island Railway has a trackage of 50 miles; the Public Service Corporation, a trackage of six miles; and the Montreal Terminal Railway a little over 30 miles.

In 1892 the number of passengers carried totalled 11,631,386. In 1910 the number was 107,241,406. The transfers used in 1892 were under six million, whereas in 1910 they numbered 36,437,123.

The average fare in 1910 was less than 4 cents per passenger. The total wage bill per month paid out by the company amounts to about $150,000.

Early this year the management of the company fell into new hands, the election of the new directorate resulting as follows:

President—Mr. E. A. Robert.

Vice-president—Mr. J. W. McConnell.

Managing-director—Mr. D. McDonald.

General Counsel—Mr. H. A. Lovett, K.C.

Directors—Messrs. F. Howard Wilson, J. Marcelin Wilson, G. G. Foster, K.C., D. Lorne McGibbon, and F. G. Finley.

The retiring directorate consisted of—The Hon. L. J. Forget, president; Mr. K. W. Blackwell, vice-president; W. G. Ross, managing director, and Messrs. Robert Meighen, Paul Galibert, George Caverhill, and Sir Montagu Allan.

To-day the company is capitalized at $10,000,000 stock and $4,420,000 bonds.

The company has extensive plans laid for new lines in outlying districts but everything is being held in abeyance pending the result of negotiations regarding a new agreement with the city. Large new car shops are, however, under way, and will be erected this summer in the north end of the city.

Toronto Railway

The Toronto Railway Company now operates 108 miles of single track. On account of the difficulty of arriving at satisfactory arrangements with the city council few extensions have been made within the last few years, only three miles being added during 1910. This has resulted in a badly congested system of transportation at rush hours. The company has done its best to carry the people by operating the largest possible number of coaches, but the peculiar conditions in Toronto, where the business section covers only a small area, has made it impossible with the limited number of outlets from this section to get a satisfactory service. During the present year this situation will be very much relieved, for the city has finally given its consent to the building of some 25 miles of lines giving more outlets from the central section.

The rolling stock of this company comprises 583 cars. Power is obtained from Niagara Falls through the Toronto Power Company. Operation is at 600 volts d.c.

The general manager of this company is Mr. R. J. Fleming, who is also manager of the Toronto Power Company; Mr. Wm. B. Boyd is chief engineer; Mr. James Gunn, superintendent; Mr. W. R. McRae, master mechanic; Mr. M. Powers, master car builder. Mr. Fleming is also general

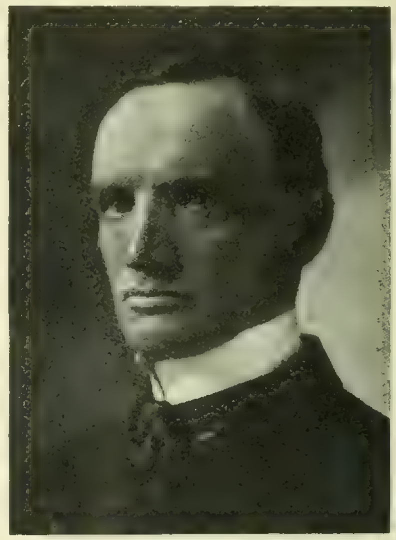
R. H. Sperling,
General Manager, British Columbia Electric Railway Company.

W. C. Hawkins,
General Manager, Dominion Power & Transmission Company

Duncan McDonald,
General Manager, Montreal Street Railway.

C. E. A. Carr,
General Manager, Quebec Railway, Light, Heat & Power Company

Robt. J. Fleming,
General Manager, Toronto Street Railway



Thos. H. McCauley,
Superintendent, Calgary Street Railway.

S. C. Pilcher,
General Manager, Sherbrooke Railway & Power Company

M. J. Hutcheson,
Superintendent Ottawa Electric Railway Company

E. S. Seixas,
General Manager, Niagara, St. Catharines and Toronto Railway Company.

G. Gordon Gale,
General Superintendent, Hull Electric Railway Company

J. B. Woodyatt,
Assistant Superintendent, Sherbrooke Railway & Power Company

V. S. McIntyre,
Superintendent, Berlin & Waterloo Ry.

J. F. H. Wyse,
Consulting Engineer, Ontario Railway & Municipal Board

W. B. Boyd,
Chief Electrical Engineer, Toronto Railway Co.

W. T. Woodroofe,
Superintendent Mainland Branches, B. C. E. R. Co.

J. A. Everell,
Superintendent, Montmorency Division

W. P. Chapman,
Chief Electrical Engineer, Niagara, St. Catharines & Toronto Railway Company.

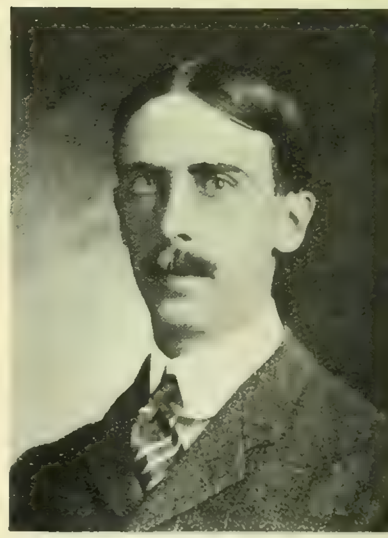
D. A. Valleau,
Superintendent, Oshawa Railway Company

Geo. C. Royce,
General Manager, Toronto Suburban Railway.

H. C. Foss,
Superintendent, Cape Breton Electric Railway

A. Hector Dion,
Superintendent, Moose Jaw Electric Ry

A. K. McCarthy,
Superintendent, Levis County Railway Company



C. F. Beames,
General Manager, Nipissing Central Ry.

F. L. S. Shelley,
Assistant [illegible] Railway & Power Company

H. M. Lloyd,
Assistant Superintendent, Mainland Branches, B. C. E. R. Company.

D. R. Kennedy,
Superintendent Transmission Lines, B. C. E. R. Co.

Donald S. Barton,

Consulting Engineer, Quebec Railway, Light, Heat & Power Company.

W. B. Powell,

General Manager, Montreal & Southern Counties.

W. R. McRae,

Master Mechanic, Toronto Railway Co.

Chas. L. Wilson.

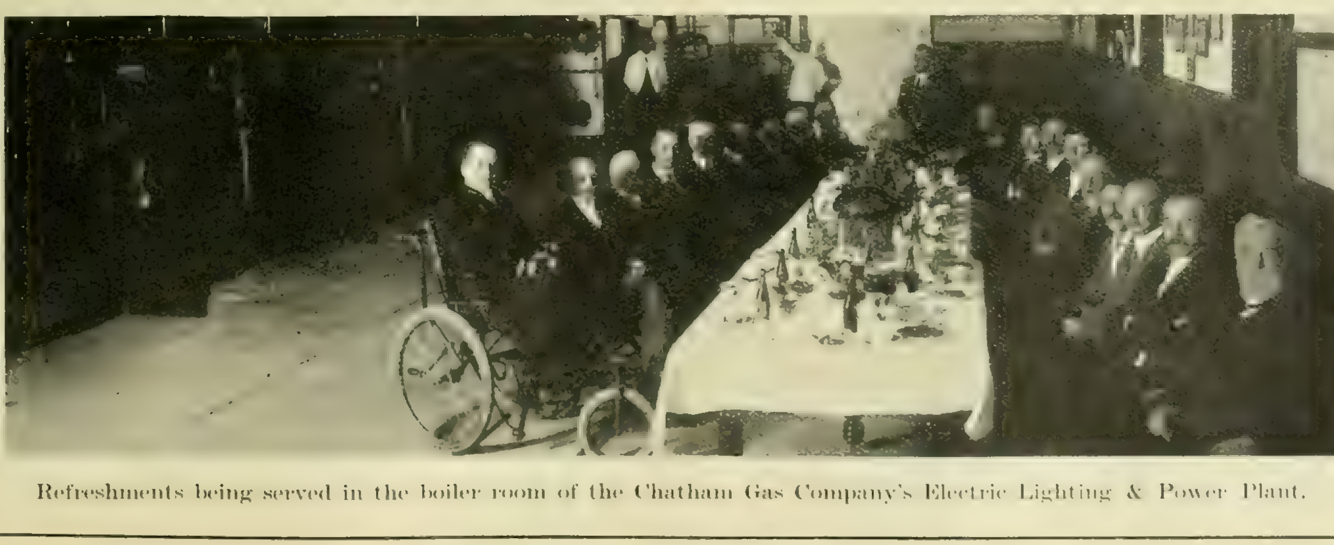
Superintendent, Toronto & York Radial Railway Company.

G. Pettingill,

Superintendent, Winnipeg, Selkirk & Lake Winnipeg Railway.

J. C. Rothery,

General Manager, Toronto Eastern Railway Company.



Refreshments being served in the boiler room of the Chatham Gas Company's Electric Lighting & Power Plant.

manager of the Toronto Power Company, which comprises the original Electrical Development Company and the Toronto & Niagara Transmission Company. There is probably no more efficiently managed system on the continent. The vigorous advertising campaign now being prosecuted by Superintendent Gunn with a view to promoting a better co-operation between the citizens, the employees and the company will yield valuable results.

Mr. Boyd is electrical engineer of both the Toronto Railway and the Toronto Power Company as well as of the Toronto Railway's subsidiary system, the Toronto & York Radial Railway. In this position he has risen to much prominence, due, no doubt in great measure, to a wide and varied electrical experience during the previous fifteen years. At the age of 20 Mr. Boyd had charge of part of the installation of the electric lighting system at the Chicago World's Fair, and later had complete charge of the maintenance and operation of the something like 200,000 electric lights connected therewith. For the next three years he filled various positions with the Westinghouse Electric Company, in Pittsburg. Later he was assistant chief electrical engineer of the Illinois Steel Company for four years, leaving there to become chief electrical engineer of the Dominion Iron & Steel Company's works at Sydney. This latter position he held until 1906, when he returned to Toronto. Within the year he has been honored by election to full membership in the British Association of Electrical Engineers.

Mr. McRae was with the Toronto Railway System as early as 1892, when the electrification of this road was commenced, and with the exception of a couple of years spent in electrical work in British Columbia, has been with the company ever since. He is now deeply interested in the question of life-saving devices and with Mr. Wyse, the Railway Board's engineer, is spending part of each day receiving applications and superintending the construction and testing of the more promising suggestions.

The Toronto Railway Company builds its own cars under the superintendence of Mr. Powers, the master car builder. It is generally conceded that the newest coaches now being put out by this company and described in a recent number of the Electrical News, are the equals in every way of the productions of the standard car-building companies.

Quebec Railway

This is one of the subsidiary companies of the newly merged Quebec Railway Light, Heat & Power. The system comprises 38.7 miles of track about equally divided between the city and suburban. During 1910 about five miles of city track were added and six more will be added during 1911. Nine miles of suburban track will also be laid during the present year. The rolling stock of this system comprises 116 passenger coaches, of which 16 are pay-as-you enter, used on the city division. Some idea of the freight business handled by this company is obtained from the fact that their rolling stock also includes 5 steam locomotives, one heavy electric locomotive, 90 flat cars, 19 box cars, and 2 steel dump cars. There are also 2 observation cars, 4 ploughs and 10 sweepers. Operation is at 550 volts d.c. throughout.

The work of the present year's extension of this road is already under way. Contracts have been signed for a double track railway from Beauport station to Montmorency Falls Park at Kent House, a distance of 3.3 miles. The railway will be rock ballasted throughout, all 80-lb. A.S.C.E. steel rails and the work is to be complete by June 20, 1911.

A shipment has just been received from the J. G. Brill Company of ten open single truck car bodies, for anticipated increase in business on the Quebec County Railway. Orders have also been placed for 50 freight cars of the Gondola type, 60,000 lbs. freight capacity, to take care of the increased freight business on the Montmorency division.

This company makes a strong feature of popular attractions through the summer. A contract has just been let for an arcade which will contain twelve stores or booths for the housing of the concessioners at Montmorency Falls Park. The attractions at the park will open June 26th.

The general manager of this company is Mr. C. E. A. Carr, formerly manager of the London Street Railway Company, and of the Montreal Park and Island Road and later with the Helena Light & Railway Company.

For purposes of operation the system is divided into the city division and the Montmorency division. Mr. A. J. McDonald is superintendent of the city division.

The superintendent of the Montmorency division is Mr J. A. Everall. Mr. Everall was born at Cap Rouge, Quebec, in 1863, and since that date has had a varied experience in railway management, culminating, in 1901, in his appointment to his present position. It is on Mr. Everell's division that the celebrated shrine of Ste. Anne de Beaupre and Montmorency Falls is situated.

The Sherbrooke Railway

This system is operated by the Sherbrooke Railway & Power Company, which recently took charge and proposes to double ths mileage during the present season. Only seven cars are operated in winter but in summer ten open cars are added. Pay-as-you-enter coaches are favored, and already two are installed. The trolley voltage is 600 d.c.

Standard P-A-Y-E. Car used in Sherbrooke

Good reconstruction work has been done on this system during the last year. Four and one-half miles of the old lines have been completely rebuilt and the old 56 pound rails have been replaced by 72 pound high T rails. Early in the spring the remainder of the old system will be rebuilt, after which the new extensions will be carried along with all speed.

A photograph of the standard pay-as-you-enter car being used by this company is shown herewith. It was built by the Ottawa Car Company.

The car bodies have omnibus sides and monitor roof, drop platform, and vestibule each end, bottom sash of windows drop into pockets in wall with a suitable hinged cover which locks for summer use. The pay-as-you-enter feature is of the usual design; interior, finished cherry; head linings, bird's eye maple; seats, rattan, non reversible; curtains, pantasote with Forsyth fixtures.

The general dimensions are as follows: Length of body, 18 ft. 5½ in.; length of front vestibule, 4 ft. 6 in.; length of rear vestibule, 5 ft. 6 in.; length over bunters, 29 ft. 5½ in.; width of car at belt rail, 8 ft. 1¾ in.; width of car at bottom, 7 ft. 7¾ in.; width of body inside of seat, 7 ft. 4 in.; seating capacity, 26 persons; weight of car body, 12,500 pounds; trucks are Brill, 21 E.; motors are Westinghouse 101 B-2.

with K11 controllers. Schoen wheels have been adopted as the standard.

The railway is now being operated by power developed by the new power plant on the Magog river. All material is now on order for completing extensions for 1911.

The manager of this company is Mr. N. C. Pilcher. Mr. Pilcher has had wide experience in electrical matters, having been with the Montreal Street Railway, the Birkenhead Street Railway, England, the Canadian General Electric Company, and the Port Arthur & Fort William Street Railway, from the latter of which he resigned to accept his present position. Mr. Pilcher's experience in interurban work leads him to recommend 1200 volts d.c. for operation of any part of a system 15 miles or over from the centre of distribution.

Mr. Pilcher's assistants are Mr. James B. Woodyatt and Mr. F. E. S. Shelley. Mr. Woodyatt is a McGill graduate and has since worked with the Niagara & Welland Power Company, the Toronto & Hamilton Railway Company, the Canadian Westinghouse Company, the Department of Marine and Fisheries, and with the Allis-Chalmers-Bullock Company. Mr. Shelley was in the freight department of the C. P. R. previous to his present position.

The Nipissing Central Railway

This company operates 5½ miles of railway between Cobalt and Haileybury. It is proposed to extend a line northward in the near future. The rolling stock includes four passenger coaches, four freight cars and one steam locomotive. Operation is at 600 volts d.c., power being obtained from the Mines Power Company's plant on the Matabitchouan river.

Quite recently there has been a merging of the electrical interests in the Cobalt district under the name of The Northern Ontario Light and Power Company, which includes the Nipissing Central Railway, and a new manager, Mr. C. F. Beames, has been appointed. Mr. Beames has had a wide electrical experience. From 1890 to 1894 he was with the Thompson-Houston and General Electric Companies, Lynn., Mass.; from 1894 to 1895 in the engineering department of the General Electric Company, Schenectady; 1895 to 1896 assistant district engineer for General Electric Company; 1896 to 1900, engineer Mexican General Electric Company, Mexico City; from 1900 to 1905, chief engineer and superintendent of construction of the Mexican Gas & Electric Light Company; from 1905 to 1907, general manager San Juan Light & Transit Company, Porto Rico; from 1907 to 1909, with Messrs. J. G. White & Company, consulting engineers, New York.

Standard Car on Berlin & Waterloo System

Mr. Beames is general manager of the Cobalt Power Company and of the Cobalt Hydraulic Power Company, and has under his control as well as the railway system the light and power systems in Cobalt, Haileybury and New Liskeard. Mr. Beames is a member of the American Institute of electrical engineers.

The Toronto Eastern Railway

This company is now on the point of commencing construction work. The charter covers a route from Toronto to Cobourg, with northern branches from Port Hope to Peterborough, Oshawa to Lindsay, Scarboro Township to Uxbridge. The plan of construction has already been approved by the Railway Board from Cherrywood east to Bowmanville. This part of the road will be built first and will be in operation by New Years of 1912.

The Toronto Eastern will reach the business centre of Toronto over a private right of way, and will serve and pass through one of the very richest farming sections in Ontario. It will supply splendid service to Whitby, Oshawa, Bowmanville, Newcastle, Port Hope, Cobourg, and smaller towns and villages by the way, and when its branches are built will also open a wide fertile district to the north. The total mileage that has now been outlined will reach in the neighborhood of 90 miles.

The president of the road is Mr. W. H. Moore, with Mr. Jesse C. Rothery, general manager. Mr. Rothery is well known to Canadian railway men. He was with the Park & River Railway from its inception and after the merging of this road with the International Railway had charge of the merged system on both sides of the river. In January, 1906, he was appointed general manager of the East Liverpool Traction & Light Company, the Ohio River Railway Company, and the Steubenville and East Liverpool Railway & Light Company. These three concerns under Mr. Rothery's management were unified into the well known Ohio Valley Scenic Route. In 1910 the construction and amalgamation of this system have been completed, Mr. Rothery again returned to Canada to take up his work with the Toronto Eastern.

The Niagara, St. Catharines & Toronto Railway

This company operates 50 miles of railway in the Niagara peninsula, connecting Niagara Falls, Thorold, St. Catharines, Port Dalhousie, Welland and Port Colborne. The line will be extended in the near future to Fort Erie, a distance of 18 miles, skirting the north shore of Lake Erie. The rolling stock includes 39 passenger coaches, 16 freight cars, and 4 electric locomotives. Operation is at 600 volts d.c., the power being obtained from the Toronto Power Company at their Niagara Falls development plant.

The general manager of the system is Mr. E. F. Siexas. Mr. Siexas has had extended experience in electrical work, having been formerly with the General Electric Company, Schnectady, from 1888 to 1892; with the electrical department of the world's fair, Chicago, from 1892 to 1893; in the same capacity at Atlanta, from 1893 to 1894; was chief engineer of the electrical department of the Nashville exposition in 1894-1895; was general manager of the Amsterdam Street Railway from 1895 to 1900, when he was appointed to his present position. The chief engineer of this company is Mr. W. P. Chapman, with offices in the Canadian Northern Building, Toronto. Mr. W. R. Robertson is superintendent.

The Ottawa Electric Railway

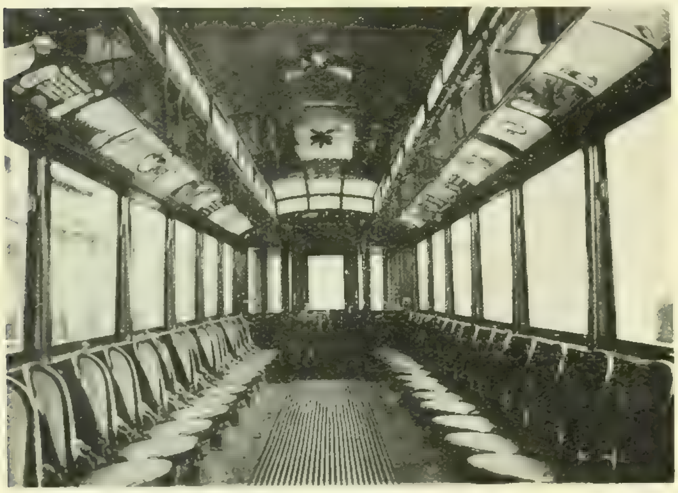
This company operates 45 miles of single track in the city of Ottawa and extensions are under consideration at the present time. The rolling stock includes 75 closed passenger cars and 85 open cars as well as 20 miscellaneous, including snow ploughs, sweepers, work cars, etc. Twenty pay-as-you-enter cars are already in operation and are being added to rapidly. The source of power is hydro-electric. Operation is at 600 volts d.c.

The Ottawa Railway Company can justly lay claim to being one of the most satisfactorily conducted systems in Canada. For many years the earnings have been very high and this company probably holds the Canadian record in this respect. It is almost an anomaly to know at the same time that the citizens of Ottawa are well satisfied with their system, having voted a short time ago by a majority of 5 to 1 to leave the system in the hands of the private corporation which controls it. This speaks volumes for the tact and ability of the company's superintendent, Mr. M. J. Hutcheson, under whose management these very desirable results have been obtained.

The Berlin & Waterloo Street Railway Company

This system is operated by a commission known as the Berlin Light Commission. There are four miles of track, operating four coaches and 3 forty-foot double truck cars. One pay-as-you-enter car has been installed and the commissioners purpose installing all of this type during the year. Operation is at 550 volts d.c., power being now obtained from the Berlin sub-station of the Hydro-electric Power Commission.

Mr. V. S. McIntyre is secretary-treasurer of the commission, and also superintendent of the Berlin & Waterloo Railway. Mr. McIntyre has been with the Berlin & Waterloo, and the Berlin & Bridgeport Street Railway Companies



Interior Berlin & Waterloo Standard Car

as assistant superintendent, and later as full superintendent, since 1903. Since the 1st of May, 1907, when the town of Berlin purchased this system from the company, he has held his present position.

The commission has traffic arrangements with the Preston & Berlin Street Railway Company, and the Berlin & Bridgeport Street Railway Company, operating cars of the above companies over a portion of their tracks in Berlin.

Calgary Street Railway System

This plant is owned by the city of Calgary, which operates 16½ miles, and is making rapid extensions. At the present time additions to the extent of 22 miles have been mapped out, and 12 more pay-as-you-enter cars are on order in addition to 18 already operated. The source of power is steam, purchased from the city plant, at 2½ cents.

Calgary is a good example of a well managed and successfully operated municipal system. The city has been specially fortunate in having efficient management. An important factor has also been the rapid increase in population, which has exceeded perhaps that of any other western city. For March, 1911, net earnings were $7,000, as compared with $2,000 a year ago.

Mr. Thomas H. McCauley is superintendent of the railway system. He was formerly manager of the Port Arthur and Fort William railway system. The rapid increase in monthly earnings, both gross and net, which Calgary Street Railway System is enjoying, is sufficient proof of Mr. McCauley's business-like management.

The Hull Electric Railway Company

This railway is operated under the name of the Hull Electric Company. There are 26½ miles of single track in operation, equipped with 35 passenger coaches and 8 miscellaneous. An extension of the line to Chelsea is under consideration. Operation is at 600 volts d.c., power being water developed.

The general superintendent of the company is Mr. G. Gordon Gale. Mr. Gale commenced his career as assistant engineer in the steam and electric plant of the Canadian Rubber Company. Early in 1907 he was superintendent of power for the Hull Electric Company; in 1908 was acting general superintendent, and in 1909 was appointed general superintendent. Mr. Gale is a graduate of McGill University, associate member of the Institute of Electrical Engineers, associate member Canadian Society of Civil Engineers, associate member American Electric Railway Association.

The Peterborough Radial Railway Company

This company operates five miles of railway, eight passenger coaches, and five miscellaneous cars. Power is generated on the Otonabee river within the city limits. Operation is at 550 volts, d.c.

This company is now one of the subsidaries of the Electric Power Company, which controls water powers along the Trent Valley. Mr. J. H. Larmouth is general manager of the railway company, as he is also of The Electric Power Company. Mr. Larmouth is authority for the statement that his company having purchased property to the west of the present car barn on King street, Peterborough, will erect a $10,000 car barn, and that the city will be given a thoroughly up-to-date street car service, including extensions to Byersville, and about the city.

Cape Breton Electric Railway Company

Under the name of the Cape Breton Electric Company, Limited, both the Cape Breton Electric Railway and the Sydney & Glace Bay Railway are operated. The former comprises 12½ miles of track, 9 passenger coaches, 3 miscellaneous. The Sydney & Glace Bay system is 19 miles long, operates 10 passenger cars and 4 miscellaneous cars. Operation of both is at 600 volts d.c. Until recently these companies operated independently, but beginning January 1, 1911, the Sydney system was taken over by the Cape Breton Company.

The manager of the two companies is Mr. Howard C. Foss. Mr. Foss is a '05 graduate of the University of Maine in the electrical engineering department, and has been with the Stone & Webster Engineering Association since that date. In addition to their railway business these companies also carry on a large lighting and ferry business.

The Moose Jaw Electric Railway Company

This road is under construction at the present time, about three miles of track being already installed, which will be increased to seven during the early summer of 1911. Six coaches will be operated at first, all pay-as-you-enter. These will be rear entrance and front exit. The Ottawa Car Company are manufacturing them. Operation will be at 600 volts d.c. generated by a Diesel oil engine plant

The erection of the system is in charge of Mr. J. B McRae, consulting engineer, Ottawa. The engineer in charge is Mr. A. Hector Dion, son of Mr. A. A. Dion, of the

Ottawa Electric Light Company. Mr. Dion is a 1909 graduate of McGill University in the electrical engineering course, since which date he has been in the service of Mr. J. B. McRae. He was appointed superintendent of the Moose Jaw Electric Railway in March of the present year.

Oshawa Railway Company

This company operates twelve miles of railway. The rolling stock comprises six passenger coaches and four miscellaneous cars. Operation is at 550 volts d.c. Power is generated by steam. For the heavy freight business a steam engine is used so that connections may be made on lines not yet electrified. A large freight business has been worked up.

The superintendent of the Oshawa Railway Company is Mr. D. A. Valleau. Mr. Valleau was born in Lennox county, Ont., in 1870. From 1886 to 1888 he was employed with N. T. & Q. Railway under Mr. M. J. Butler, C.E.; from 1888 to 1889 was operator on Canadian Pacific Railway; from 1889 to 1890 was time-keeper and dispatcher, Bay of Quinte Railway; from 1900 to 1908 was assistant superintendent, Bay of Quinte Railway, since which time he has been superintendent at Oshawa.

Toronto Suburban Railway Company

This company operates 11 miles of single track railway from West Toronto westward. The rolling stock comprises 12 passenger coaches and 3 miscellaneous cars. The system is being gradually changed to pay-as-you-enter, two of this type being already in operation. Power is obtained from the Toronto Power Company. Operation is at 600 volts d.c.

The manager of this system is Mr. Geo. C. Royce. Mr. Royce has been manager for ten years, during which time the company has made considerable progress. Under his management a successful power and light department has also been added. Mr. Royce states that it is the intention of his company to add about 21 miles of trackage to their system in the near future.

Sandwich, Windsor & Amherstburg Railway Company

This railway is the Canadian branch of the Detroit United Railway system, comprising 36 miles of single track, 15 passenger coaches, and 18 miscellaneous cars. Power is obtained from a steam plant and delivered at 500 to 600 volts d.c.

The general manager of the company is Mr. James Anderson, with head office at Windsor. Mr. Anderson was one of the original purchasers in 1893 of the Sandwich, Windsor & Amherstburg Railway, which was operated independently until 1901, when it was taken over by the D. U. Railway Company and Mr. Anderson appointed general manager. In the interval the road has been extended to Amherstburg and Tecumseh.

The Levis County Railway Company

This company operates 10¼ miles of track in the town of Levis, Que. The rolling stock comprises 21 passenger coaches and numerous freight and other cars. Operation is at 600 volts d.c. Power is purchased from the Quebec Railway, Light, Heat & Power Company.

The manager of the railway is Mr. Arthur K. McCarthy. Mr. McCarthy is a graduate of McGill University of the year 1906, when he obtained his B.Sc. degree. After graduation he was with the Stone & Webster corporation in their Boston office and was later superintendent of the railway department of the Cape Breton Electric Company, of Sydney, one of this corporation's subsidiaries. Since 1908 Mr. McCarthy has held his present position.

The Port Arthur & Fort William Railway Company

This system is municipally owned and operated by the twin cities of Port Arthur and Fort William. The mileage is about 22, and further additions are projected. Thirteen coaches, eight of which are pay-as-you-enter, and three miscellaneous cars complete the rolling stock. Operation is at 600 volts d.c. Each town supplies part of the power, the Fort William end from the Kaministiquia Power Company, the Port Arthur end from their own water plant which is now being complemented by power supplied by the Kaministiquia Company, through the Ontario Hydro-electric Commission.

The general manager of the system is Mr. M. O. Robinson.

The London Street Railway

There are 33¼ miles of single track in this system, which has not been added to recently. Forty-eight passenger coaches, two sweepers and one work car comprise the rolling stock. Power is steam generated. The motors operate at 550 volts d.c.

The general manager of the company is Mr. Charles B. King, who has been with this railway company for many years. Negotiations have been proceeding with the Ontario Hydro-electric Commission looking to the purchase of power from the latter for operating the railway. Later reports indicate the probability that Mackenzie & Mann interests have secured control and will extend their own Niagara line to London.

The Dominion Power and Transmission Company

The railway system in and around Hamilton is operated by this company under the general management of Mr. W. C. Hawkins. The system comprises a total of 104 miles, made up as follows: Hamilton street railway, 22 miles; Hamilton and Dundas Street Railway, 6 miles; Hamilton, Grimsby and Beamsville Electric Railway, 23 miles; Brantford and Hamilton Railway, 23 miles. The total number of cars in operation is 87 passenger, and 10 miscellaneous. Operation throughout is at 575 volts, power being obtained from the company's generating plant at DeCew Falls near St. Catharines.

The management of the whole railway system is in the hands of Mr. Edward P. Coleman.

The Winnipeg Electric Railway Company

The number of miles now operated by this company is 110. 5½ miles were added last year and several extensions are proposed for the near future. 229 coaches are operated in addition to 14 miscellaneous cars. Power is obtained from the company's own plant at Lac du Bonnet on the Winnipeg river and from an auxiliary steam plant at Winnipeg, which is now being enlarged. Operation is at 550 volts d.c.

The general manager of this company is Mr. Wilford Phillips; superintendent, Mr. Wilson Phillips; chief engineer, Mr. Ross. The Winnipeg, Selkirk and Lake Winnipeg Railway, 22 miles in length, of which Mr. Pettingill is superintendent, is operated as a subsidiary of this company, as is also the Suburban Rapid Transit Company, which comprises 19 miles of trackage along the north and south side of the Assiniboine river and connecting with Headingly. These figures are included in the above 110 miles total.

Toronto & York Radial Railway Company

This company operates 81 miles of track, 41 passenger coaches and 19 miscellaneous cars. The system comprises the Metropolitan division, running north from Toronto through Newmarket to Jackson's Point and Sutton; a short line in East Toronto, known as the Scarborough division, and the Mimico division, running west from Sunnyside along the north shore of Lake Ontario. Operation is at 600 volts

de ted by 16,000 volt, 60 cycle current from the Toronto Railway, of which this company is a subsidiary.

The manager of the company is Mr. W. H. Moore, electrical engineer, Mr. Wm. B. Boyd; superintendent, Mr. Wilson.

The Nelson Street Railway System

The city of Nelson operates and owns its system. A little over two miles is now in operation with two coaches. The hilly nature of the city of Nelson has meant almost insurmountable obstacles in the way of operating this system but it is evident that the town is determined to progress and to this end are spending considerable additional sums in placing their little system on an up-to-date basis. Power is obtained from the city's own hydro-electric plant at Bonnington Falls, from which current is transmitted at 12,000 volts and through a motor generator set cut down to 600 volts d.c., at which the motors are operated.

Chatham, Wallaceburg & Lake Erie Railway

Four miles were added to this system in 1910, and six will be added during the present year, which will bring the total mileage up to 46 miles. Seven passenger coaches and two d.c. electric locomotives comprise the rolling stock. Operation is at 550 volts d.c., the source of power being a pair of steam and gas engine units.

The operation of a suburban line of this length on 550 volts d.c. is not considered satisfactory by the management, who favor a higher d.c.voltage (probably 1200) with motors series connected.

The Halifax Electric Tramway Company

This company operates 14½ miles in the city of Halifax. The pay-as-you-enter system is being gradually inaugurated, four cars being already equipped. These were manufactured by the Silliker Car Company. Operation is at 575 volts d.c.

The general manager of the company is Mr. J. W. Crosby.

The Galt, Preston & Hespeler Railway Company

This company operates 21 miles of interurban railway trackage, between the towns indicated. Eight passenger coaches are operated in addition to 15 miscellaneous cars. This system is now operated from Niagara Falls power, taken from the Preston sub-station. Operation is at 600 volts d.c. The cars are modern and well equipped and an excellent interurban service is provided.

Windsor, Essex & Lake Shore Rapid Railway Co.

This company operates forty miles of interurban railway track connecting Windsor, Essex, Kingsville, etc. Five passenger coaches are operated in addition to twenty miscellaneous cars, including one large electric locomotive. Power is generated by steam. Operation is at 600 volts d.c., the feed wires carrying a current of 13,200 volts a.c. Mr. A. Eastman is general manager of the company with head office at Kingsville, Ont.

The Edmonton Radial Railway Company

This system is municipally operated, consisting of 13 miles of trackage, 17 passenger and 3 miscellaneous cars. The system is being rapidly changed to pay-as-you-enter, 12 of the 17 being already installed. Fourteen more cars of this type designed for single end operation are now on order. Operation is at 600 volts d.c., power being generated by steam. The road operates in and between the twin cities of Edmonton and Strathcona.

The Montreal and Southern Counties

This is a new road operating eight miles of single track across the river from Montreal. Four miles of track were added during 1910 and fourteen more are in course of construction during the present year. Ten passenger coaches are operated in addition to other miscellaneous rolling stock. Power is obtained from the company's own steam plant, delivering 600 volts d.c. to the motors

St. John Railway Company

This company operates 19½ miles of track and proposes adding another couple of miles during the present season. Fifty-five passenger coaches are operated and seven miscellaneous cars. Operation is at 550 volts d.c., power being obtained from the company's own steam plant.

Mr. H. M. Hopper is general manager of the company.

The Sarnia Street Railway Company

The Sarnia Street Railway Company operates 9¼ miles of trackage and proposes extending its line two miles along the water front of Lake Huron. Ten coaches and one baggage car comprise the rolling stock. Operation is at 550 volts, obtained from a 250 and a 110 kw. generator. The manager of this company is Mr. H. W. Mills, with head office at Sarnia.

The St. Stephen Railway Company

This system comprises 6½ miles of railway in St. Stephen, N.B., with 8 passenger coaches. Operation is at 600 volts d.c., obtained from a 150 kw. steam driven generator. This road is operated by the Calais Street Railway Company, of Calais, Maine, of which Mr. C. F. Pray is superintendent.

The Cornwall Street Railway

This company operates under the name of the Cornwall Street Railway, Light & Power Company, Limited. The number of miles of track operated is 6½, with 10 passenger coaches and 2 freight locomotives. Power is obtained from a small water plant. Operation is at 500 volts d.c.

London & Lake Erie Railway Company

The London & Lake Erie Railway & Transportation Company operates 29 miles, 12 passenger coaches, and 5 miscellaneous cars between London and Port Stanley. The trolley voltage is 600 d.c., feeder voltage 10,000 a.c. The system is operated by steam from London.

The Kingston, Portsmouth & Cataraqui Railway Company

This Company operates 8 miles of road and 19 passenger cars, with other rolling stock. Power is obtained from the city steam plant of Kingston. Operation is at 500 volts d.c. The contract price of power to the railway is 1.2 cents per kw.h.

The Guelph Radial Railway Company

This system comprises six miles of track with proposed extensions of one mile. Eleven passenger coaches are operated and one freight motor. On February 1st the Hydro-electric Commission began supplying them with Niagara Falls power Operation is at 600 volts d.c

The Monctor Tramways Company

This railway will be operated by the Moncton Tramway, Electricity and Gas Company. The system is under construction at the present time and part of it will be in operation during the present season. Mr. Boggs will be manager of the railway.

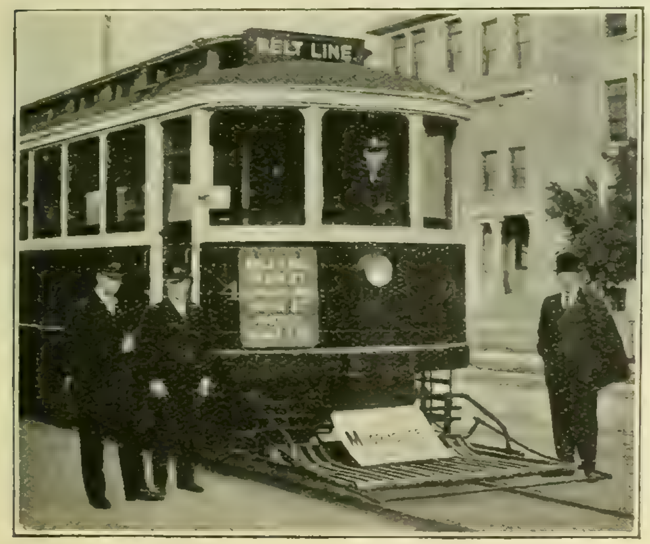
Edmonton's Telephone System

Manager Griffith, of the municipal telephone system, reports telephones being installed at the rate of one hundred per month. There are nearly four thousand subscribers here.

Street Car Fenders and Wheel Guards. Report of New York Commission. The Situation in Canada

One of the most interesting developments in street railway work at the present time is along the line of effective life-saving devices. A short item on experiments being carried out by the Toronto Railway Company appears elsewhere in this issue. The difficulty does not seem to be disinclination on the part of operating companies to install proper devices, but rather the impossibility of obtaining devices which are uniformly operative in emergency.

Some two years ago the Public Service Commission of New York made a series of very exhaustive tests on different, more or less proved wheel guards and fenders, and issued a report. In these tests dummies were used representing as nearly as possible the persons who would be placed in dangerous positions and the results showed how impossible it was to devise any scheme of fender or guard that would invariably pick up its victim. A total of eighteen hundred tests were made. In the judging, percentages were used representing the efficient operation of the particular fender under examination and of some seventy different wheel guards and fenders tested, 24 only received 75 per cent. or more. Of these 15 represented fenders and 9 wheel



The Moorhouse Fender

guards. The percentages received by the different wheel guards varied from 81.6 per cent. down. The highest percentage was obtained by a non-automatic projecting fender shown by the Eclipse Railway Supply Company. The Worcester Railway Supply Company came next with 80.6 per cent.; the Parmenter fender got 80.2 per cent.; the American Automatic Fender 80.1 per cent.; the Sterling-Meaker 79.8 per cent.; the J. O'Leary fender 79.1 per cent.; the Bolduc Fender Company 78.5 per cent.; W. H. Quin, Toronto, 78.2 per cent.; the Consolidated Car Fender Company 78.2 per cent.; the Watson Fender, Vancouver, 77.3 per cent.; the American Fender Company 77.2 per cent.; the Pittsburg Car Fender Company 76.7 per cent.; the Fiske Fender 75.5 per cent.; the Wood Fender 75.2 per cent.; the Jenkens Automatic, Toronto, 75 per cent. The percentages of the wheelguard tests were higher. The Hudson & Bowring wheelguard obtained 86.9 per cent.; the Parmenter wheelguard 83.6 per cent.; the Sterling Equipment Company 82.5 per cent.; the Watson wheelguard, Vancouver, 80.6 per cent.; the Sterling-Meaker 79.7 per cent.; the American Fender Co., 76 per cent.; Sterling-Meaker No. 2, 76 per cent.; W. Martin 75.6 per cent.; J. H. Caliga, 75.2 per cent.

The arrangements for making the tests included 100 feet of track paved with cobble stones and 100 feet paved with asphalt, these two forms of pavement comprising those predominating in Greater New York. A single-truck car and also a double-truck car were rebuilt and arranged so as to give platform dimensions as found upon the cars in New York City. The tests were made at speeds of 8 and 15 miles per hour upon each of the two forms of pavement. These speeds fairly represent the average operating conditions in Greater New York, and were calculated to bring out the relative merits of the devices for use within the First District, which was the principal aim of the tests.

In their report the New York Commission further state that in the selection of a fender of wheelguard, the railway manager must give consideration to the practicability of the device he adopts to suit the operating conditions governing his road, such as pavement, track, grades, short curves and curves that pass close to the sidewalk at corners where it is likely that a projecting fender would catch pedestrians. Also snow and ice must enter largely into his consideration, especially in the selection of a projecting fender or pick-up type of wheelguard.

The tests, successful as they were, unfortunately proved no one fender or wheelguard superior in all its parts to the others.

More recently the Quebec Public Utilities Commission has rendered a decision in connection with the life-saving devices in operation on the Montreal Street Railway System. This commission did not make any tests but examined a number of witnesses and made a recommendation. In the report of the commission they state that three kinds of wheelguards appear to be in limited use in Montreal, the principal of which is that manufactured by Hudson & Bowring, Manchester, England; and that there are two kinds of fender, one made of wood slabs with trip bar of wood, manufactured by the Montreal Street Railway Company, the other called the Providence fender, manufactured by the Consolidated Car Fender Company.

After examining a number of witnesses the commission report their belief that under the conditions prevailing in Montreal the value of a fender in addition to an effective automatic wheelguard is more than doubtful, and in conclusion the commission directs and orders that all cars be equipped with an automatic mechanical drop wheelguard, the apron to be attached to the truck. If this is not possible in some cases, attachment must be to the platform as near to the truck as possible, and the wheels further protected by a wire rod screen in addition. This wire rod screen is to be placed upon all single truck cars in addition to the wheelguard.

As soon as the cars are equipped with wheelguards the fenders must be removed.

In other cities, however, the fender meets with the most favor. As already intimated, Toronto Railway favors a fender of the automatic trip type of their own design. This company claims that since the installation of this fender some 90 lives have been saved by their fender, and it is a recignized fact that Toronto is pretty free from serious street car accidents. The Toronto fender is the W. T. Watson type.

The illustration shown herewith represents the Moorhouse fender, invented and manufactured by Mr. J. M. Moorhouse, Winnipeg. The Parmenter wheelguard, which received 83.6 per cent. in the New York tests, and the Watson fender may be seen elsewhere in this issue.

The Reynolds Electric Flasher Manufacturing Company announce their removal from 191-3 Fifth Avenue to more modern and spacious quarters at 617-631 W. Jackson Boulevard, Chicago.

Personals

Mr. P. W. Sothman, Chief Engineer Hydro-electric Power Commission, sails for the continent on April 25

Mr. J. G. Rossman has been appointed manager of the new civic power plant at Winnipeg.

Mr. E. J. Sifton has been appointed to prepare plans and specifications for a municipal light and power plant for Hamilton.

Mr. R. Y. Ellis is the city's choice as their member of the commission of three which will be responsible for the management of Toronto's distribution system.

Mr. Eugene Creed, sales manager of the Toronto Electric Light Company, has resigned to take a similar position with the Morris Iron Company, of New York City.

Mr. J. B. McRae, Consulting Engineer, Ottawa, has been engaged by the city council of Saskatoon to make a report on the street railway and power question in that city.

Mr. R. S. Kelsch has been appointed to act in the interests of a majority of the electrical operating companies in Montreal in the carrying out of the city's general plan of placing all wires underground.

Mr. J. L. Stiver, a clerk in sub-division B of the second division in the electrical engineers' branch of the Department of Inland Revenue, has been transferred to Toronto as inspector of gas and electricity for the inspection district of Toronto.

Mr. A. M. Gray, assistant professor in the electrical department at McGill University, recently read a paper before the Electrical Section of the Canadian Society of Civil Engineers on the subject "The Operation, Construction, Application and Characteristics of Induction Motors."

Mr. Joseph P. Cleal, 243 Macdonnell avenue, Toronto, has been appointed Canadian representative of the Phellps Manufacturing Company, manufacturers of heating devices, flashers and electrical specialties. Mr. Cleal will have charge of the manufacture and sale of their entire line in Canada.

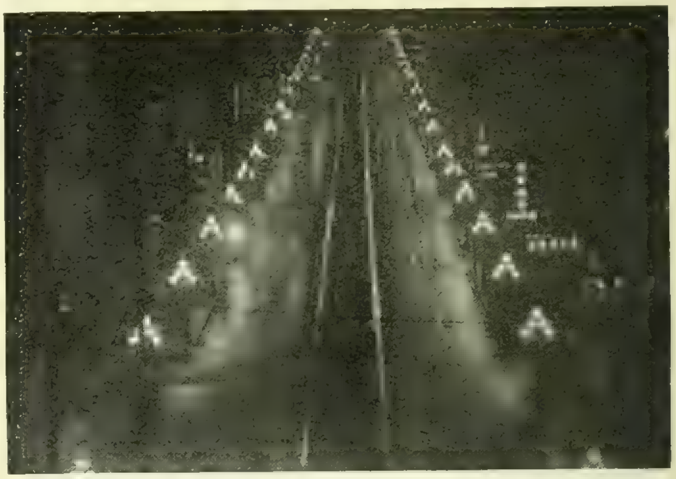
Mr. H. D. G. Crerar, the Electrical Superintendent Canadian Tungsten Lamp Company, is at present in Europe perfecting his experiments with the drawn wire filament. He will be absent about three months. Mr. P. D. Crerar, K.C., the Hon. Secretary, Canadian Tungsten Lamp Company, and Mrs. Crerar, who have also been spending some time in Europe, arrived home after a very enjoyable trip. The trip was taken for the benefit of Mrs. Crerar's health, which has been entirely restored.

Mr. Charles Brandeis has been appointed consulting engineer for the King Edward Park Company, Limited, of Montreal, which concern is establishing a large amusement park similar to the celebrated Coney Island of New York. This park will be situated on the Island of Gros Bois, near Montreal. It is estimated that 700 h.p. will be the immediate requirements, and probably double this amount by next year. Power will be purchased from a Montreal concern and transmitted by means of a submarine cable 7,500 ft. long and designed for 13,200 volts. A local steam plant will act as a reserve. The order for the submarine cable has been placed with the Canadian British Insulated Company, Limited, of Montreal.

Mr. H. A. Burson, chief engineer of the Packard Electric Company, of St. Catharines, Ontario, has resigned his position to accept that of commercial engineer with the Canadian Crocker-Wheeler Company, Limited, whose head office and works are located at St. Catharines, Ontario. Mr. Burnson graduated from McGill University in 1901 with the degree of B.Sc., and the following year received the degree of M.Sc. for special research work. After spending two years on the staff of the Department of Electrical Engineering of McGill University, he entered the Engineering Department of the Bullock Electric Company, of Cincinatti, specializing in the design of alternating current apparatus under Mr. B. A. Behrend. When Allis-Chalmers-Bullock, Limited, of Montreal, was formed he was placed in charge of their electrical engineering department. In 1906 he severed his connection with Allis-Chalmers-Bullock to go with Packard Electric Company as chief engineer and general superintendent.

Progress Notes from Vancouver

The erection of the ornamental five-light standards on Hastings street, Vancouver, is to be proceeded with at once, and completed before September 1st. The total cost of the installation is placed at $20,000. That it pays to have well-lighted streets is demonstrated by the fact that since the Granville street system of ornamental lighting was installed the business men on that thoroughfare have been enjoying



Granville St., Vancouver, B.C.

a greatly enhanced evening trade, the presumption being that it is at the expense of Hastings and Cordova street business men, their usual customers being induced to parade Granville street owing to the brightness and attractiveness of the new system of illumination.

Two new power development companies have recently been incorporated under the British Columbia Companies' Act, viz., the Lilloett Power and Light Company, Limited, capital $50,000, and the Alberni District Electric Light and Power Company, Limited, capital $25,000.

It is reported that the British Columbia Electric Railway Company will in the near future build a branch from Cloverdale to Blain, Wash. The line would tap a rich freight territory, and the passenger business would also be heavy.

C. H. F. Carter and C. C. McKenzie, general electricians and contractors, have opened a store on Fort street, Victoria. Both members of the firm were formerly in the employ of Hinton Electric Company, and are experts in their line.

Mr. Geo. F. Henderson, Sr., president and managing director of the Bull River Electric Power Company, returned a few weeks ago from an extended business trip to Toronto and Montreal, where part of the equipment needed will be built. Good progress is being made on the plant, which will furnish power and light throughout the Cranbrook district.

The Alberni District Electric Light & Power Company, Limited, with head offices in Alberni, Vancouver Island, was recently incorporated, with a capital of $25,000. A plant is being installed to furnish light to the citizens of that town and Port Alberni. For the present current will be generated by means of a steam plant, but a water power will be connected up as soon as possible.

The British Columbia Electric Railway is planning large expenditures on extensions in connection with the New Westminster system. A line to Lulu Island is now under construction, and the Fraser Mills line will be commenced in the near future.

Mr. George Halse, secretary of the British Columbia Telephone Company, returned recently with Mrs. Halse and family from a trip to Honolulu, their stay having been shortened on account of the outbreak of cholera in the islands.

Passenger traffic on the Victoria lines of the B. C. Electric Company for the first two months of the year showed an increase over that of the corresponding period a year ago of no less than thirty-eight per cent. The aggregate number of passengers carried was 1,069,082, compared with 774,475 in January and February, 1910. The figures for the two months were:

	1911	1910
January	$546,092	$415,150
February	522,990	359,325

Great Electrical Activity in the Maritime Provinces

The committee appointed some weeks ago by the shareholders of the Nova Scotia Telephone Company to inquire into the financial position of that company, and also to report upon the resources of the Maritime Telegraph and Telephone Company, upon the offer of a lease by the latter company, has completed its work, and the report was presented at a meeting of the directors of the latter company.

It is understood that the report recommends that a merger of the two companies be effected, and that terms are suggested which the committee believe will be satisfactory to both concerns.

Nova Scotia Power Propositions

The Nova Scotia Power Company have obtained their charter from the government of Nova Scotia and will develop the water power on the Mersey river which has its rise in Lake Rossignol, the largest body of fresh water in Nova Scotia. The water power is described by engineers to be the best in Nova Scotia.

It is known now that the parties interested in the Nova Scotia Power Company have secured control of the stock of the Halifax Tram Company. The stock has been purchased in open market by brokers of Halifax. The present intention is to supply current to operate the Halifax electric cars and electric light from the large plant on the Mersey river. The towns of Liverpool, Bridgewater, Mahone Bay and Lunenburg are interested and are on the line of the proposed transmission. The town of Dartmouth can also be reached easily and the company believe they have a chance to sell a large part of their output.

A second company, supposed to have Sir Frederic Borden as one of its promoters, have secured the water rights on the Gasperaux river near Wolfville in Kings County, and it is reported that they will soon enter the field for business. The parties in control of the Kentville Electric Light Company and the Wolfville Electric Company are in very close touch with the promoters and there is no doubt but that these towns will be the first to be connected with the water power at Gasperaux.

Will Electrify Steam Road

The New Brunswick and Prince Edward Island Railway between Sackville and Cape Tormentine is about to come under the control of Messrs. Chas. W. Fawcett, Chas. Pickard, of Sackville, and M. C. Siddall, of Port Elgin. These capitalists are the owners of the Sackville Electric Light & Telephone Company, which supplies electric current for lighting the town of Sackville. The intention is to equip the road with electric cars for the passnger traffic and use the present steam equipment for the freight service.

Messrs. Fawcett, Pickard and Siddall have had interviews with Edison and Beach and they are contemplating the purchase of one or more of the cars equipped with the Edison storage battery, and it is expected that the new company will at least test these cars on their road for the first time in Canada. Their scheme includes a line of steamers between Prince Edward Island and Cape Tormentine and possibly a freight steamer service up the St. Lawrence to Montreal and Toronto. These same people own the electric light plant at Port Elgin and free stone quarries in Sackville. Mr. Fawcett is one of the proprietors of the stove foundry owned by the Chas. W. Fawcett Manufacturing Company.

Two Years for Theft of Electric Current

For tampering with meters in his place of business, John G. Speardakes has been found guilty by Judge Forbes in the County Court and sentenced to two years with hard labor in Dorchester Penitentiary and to pay a fine of one thousand dollars, half of which is to be paid to the St. John Railway Company, and half to the county. In default of payment he must serve an additional two years.

Inspector of Gas and Electricity

The Canada Gazette announces the appointment of John Toale, of the city of Halifax, to be inspector of gas and electricity for the district of Halifax, which comprises all the province of Nova Scotia. Samuel W. Withers, of the city of Halifax, has been appointed assistant inspector for the above district.

No Lights in Lunenburg

The town council and the Lunenburg Gas and Electric Company failed to agree on a price for lighting the streets and as a result the streets are in darkness since the first of April. It is reported that the company are willing to have the dispute referred to the public utilities board but the council refuse to consent.

The "Complete Arrester"

The Electric Service Supplies Company announce that they have recently adopted the phrase "The Complete Arrester" as applying to the Garton-Daniels Lightning Arrester. The reasons given for the adoption of the use of the word "Complete" are quite interesting.

A lightning arrester must perform three functions; it must offer an easy path to ground for static or lightning; this is usually obtained from small air gap distance and low series resistance.

It must also prevent surges and similar disturbances which sometimes occur when the arrester is discharging; this is accomplished by means of low series resistance.

It must further provide some positive means for interrupting the flow of line current following a lightning discharge to ground.

The unique construction of the Garton-Daniels Lightning Arrester lies in the fact that it has all three features, a small air gap, low series resistance and a circuit breaker in combination in one unit, so making it "Complete" in itself.

Canadian Electrical Association

The secretary-treasurer of the Canadian Electrical Association has sent out a convention notice under date April 12th, announcing that this year's convention will be held at the Clifton Hotel, Niagara Falls, Ont., on Wednesday, Thursday, and Friday, June 21, 22 and 23.

It was the intention earlier in the year to hold this annual convention in Winnipeg, but owing to proposed reorganization and extension of the association, which is expected to take place during the coming year, it was thought advisable to postpone this trip until a later date.

The secretary points out in his announcement that Niagara Falls is one of the most educative points on the continent, there being now in operation at that point half a dozen of the largest and most efficient plants to be found anywhere in the world.

Mr. W. L. Adams, of the Ontario Power Company, has been appointed Chairman of the Committee of Arrangements, and Mr. W. A. Martin, Assistant General Manager of the Toronto Electric Light Company, is Chairman of the Papers Committee.

President Coate has Resigned

Mr. P. S. Coate, who recently resigned as President of the Canadian Electrical Association, in protest against affiliation with the National Electric Light Association, has forwarded to the Electrical News a copy of his letter to the Managing Committee, which we publish below:

Chatham, Ont., March 16th, 1911.

The Managing Committee,
Canadian Electrical Association,
Toronto, Ont.

Gentlemen,—Since the special general meeting of the association was held at Toronto on January 20th last, when it was decided to affiliate the Canadian Association with the National Electric Light Association of the United States, I have given a great deal of thought to the present situation of the Canadian Association, and to my own position as president, and I have come to the conclusion, very regretfully indeed, that it would be best for me under existing conditions, to resign my position. This resignation I now tender, and I wish the Managing Committee to accept it at their meeting called for the 17th inst.

As the members of the committee perhaps will know, I am not in sympathy with the action taken at the general meeting, and although I believe the meeting to have been regularly called and the resolutions legally carried, it appears to me that in making a change in the constitution of the association, the most momentous change in its history, the resolution bringing about such a change should not have been carried by eleven members out of a total membership of some four hundred and seventy-four (474), five of these members representing one company.

I am well aware that the representatives of the larger operating companies favor amalgamation, and that the majority of the managing committee have the same feeling, yet I firmly believe, and I have heard no argument to alter my belief, that it would have been infinitely better for the future had the Canadian association remained a purely Canadian organization, having intimate relations with the National Electric Light Association as a sister society of a different nationality, each willing and anxious to help the other in every possible manner for the upbuilding and advancement of a common cause, the great electrical industry.

I believe that had the Canadian association remained a purely Canadian national organization, with, particularly, the larger Canadian companies remaining as members of the National Electric Light Association, the spirit of energy, progress and national pride that is the heritage of true Canadians, might and would have induced these members of the different company sections, who are now, or are about to be members of the National Electric Light Association, to become members of company sections of the Canadian Electrical Association, having access to the literature of the National Electric Light Association through their company's membership in that organization. So far as I can see, such an arrangement would have given the members of the company sections practically all the benefit they will receive under the affiliation idea, and would have made the members of the Canadian association more self-reliant and capable in every sense of the word.

I had thought, after the last annual meeting of the association at Muskoka, that with the splendid assistance promised from many quarters, the Canadian association was about to become a greater power in the land, with broader views, more extended scope, and larger membership, in fact, a Canadian national organization, instead of an interprovincial association, as it has practically been in the past; and that with harmonious and friendly association with the National Electric Light Association, the Canadian organization would become an institution of which every member might be proud. I realize that in the past the association has been largely kept up by unselfish devotion to its affairs by men who have been for years on the managing committee or acting as its officers. Some of these men have been elected again for this year and their opinions are entitled to every respect, and they are so regarded by me. These men, together with others, forming a large majority of the members of the executive committee, favor affiliation with the National Electric Light Association, and I believe under the new conditions they should be allowed to work out the future of the organization, unhampered by a presiding officer who is not in any manner in sympathy with their ideas.

My resignation will, in the natural order of things, bring to the presidency, one who, I understand, is in complete accord with the views of the majority of the managing committee, and in this way, I trust that with kindred ideas, the future actions of the committee may prove to be in the best interests of the association.

In placing my resignation before the managing committee, I wish to thank the members for the many kindnesses shown to me while I have had the distinguished honor of being an officer of the association, and I wish again to express my sincere regret that circumstances have arisen which have made such an action on my part seem to be necessary.

Believe me to be,
Very faithfully yours,
(Signed) P. S. Coate,
President.

A Letter of Protest

Richmond, Que., April 15, 1911

Editor, Electrical News

Believing recent events in connection with the Canadian Electrical Association are of interest to your readers, I venture to place before them with your kind consideration, some reasons why the amalgamation with the National Electric Light Association of the United States should not take place

(1) The constitution of the Canadian Electrical Associa-

tion has been violated by the action of the meeting of January 20th last as follows:

(a) The circular calling the meeting of January 20th was issued by the secretary instead of the president See Art. VIII.

(b) That circular called a "special" general meeting, which by Article XXII. cannot deal with amendments to the constitution.

(c) Article XIII. indicates that "general" meetings of the executive section can only be held at the annual convention.

(d) Members other than those of the "executive section" were present at the January 20th meeting, which by Article IV., clause e, invalidated the proceedings.

(2) Article XIII. of the National Electric Light Association prohibits any form of membership by any association in any geographic section.

(3) Article V. and Article XVII. of the N. E. L. A. constitution show that only at the N. E. L. A. annual meeting can amendments to the constitution be made.

The foregoing shows why the action is illegal and consequently any diversion of funds and refusal to renew membership of present Canadian Electrical Association members who offer their regular membership fees would render those doing so liable to serious responsibility.

The reasons why the amalgamation desired by some should not take place are:

(1) We should of necessity lose our distinctive character as a Canadian association by becoming a "geographical section" of a United States association.

(2) All benefit which we could derive can be obtained otherwise.

(3) What will we be told at Ottawa when we ask for Canadian government consideration for a United States Association of which we are only a "geographical section?" Surely we will (or should) be told "go to Washington."

The only honest and satisfactory way to settle this matter is to change, at our next annual convention, our constitution providing for a letter ballot on changes in the constitution when those unable to attend but vitally interested can exercise their discretion in the matter.

Yours truly,

(Signed) J. W. Harkom,

Managing Director R. C. E. Co.

A Storage Battery with Great Promise

The value of the storage battery in electric traction operations has come to be recognized as an important factor in the economy and continuity of operation. This is especially true of the stationary type, but doubtless only because no movable battery has yet been proven to have fulfilled the necessary qualifications of light weight, small volume, long life, rapid charge and discharge, etc. Much has been said of the Edison storage battery in respect to these qualifications, but it does not appear that the performance of the batteries will equal the promises of their great inventor. The extra expense will prevent its competition with the established types in stationary work; automobiles equipped with them do not give the sustained speed of the gasoline engine and the battery-equipped rail cars are not winning favor as rapidly as was anticipated.

The Edison battery may be considered a step towards the solution of the storage battery problem. It is not the solution itself. On account of the glamor surrounding the name of the great Edison the success of the battery bearing his name has been a foregone conclusion before its trial, and the ordinary course of things being thus reversed, this battery has had almost as much difficulty in disproving to the public its value as the panacea of all electrical ills as an equally efficient battery under some other name would have in proving its real worth.

It may be that for some such reason a recent storage battery production of apparently great promise, the invention of Mr. Thomas A. Tate, has been given proportionately less publicity than it deserves. This is the so-called "bifunctional" accumulator, so named from the fact that each plate instead of being either a positive or negative, as in the ordinary lead battery, contains both the positive and negative elements and so is a complete battery in itself.

This battery though just recently placed on the market has given good results under very varying conditions. It is in use on a section of the Toronto & York Radial Railway in connection with that company's electric signal system; it has been used quite extensively in automobile dray work where power rather than excessive speed is required, and is now being installed in a large number of motor busses in one of the largest cities of the world

From its performance to date and under experimental tests this battery appears to be at least as well suited for tram work as any battery on the market.

In this connection tests and reports recently made by the engineering firms of Ross & Holgate, Montreal, and Moore & Scollan, Toronto, are of value as indicating what may be expected of this invention. We quote from each report as follows:—

Ross & Holgate Report

"As regards this cell, which is of the well known lead type in practical use for the past 25 years, the chemistry, except in some obscure details, is thoroughly known, and nothing novel appears.

In the Tate cell the mechanical design is revolutionary with the object of minimizing buckling and shedding of materials by making a large number of strip plates, each free to take up its own contraction and expansion and decreasing sulphating by the rapid and natural circulation of the electrolyte, the object of the construction being to maintain the density and current flow constant over the whole face of the active materials.

The design therefore, so far as chemical action is concerned, is directed towards the following:—

(a) Provision for the expansion and contraction of the plates without buckling or shedding of active material.

(b) Equalization of chemical action over the whole surface of the active materials.

(c) Equalization of density of the electrolyte.

(d) Liberation of gases in a natural manner.

(e) Elimination of filtering action of the solution by the envelope.

(f) The minimizing of secondary actions between plates by the interposition of envelopes.

(g) The exposure of the greatest possible surface of active materials.

How these objects are attained in the construction is indicated in the next item.

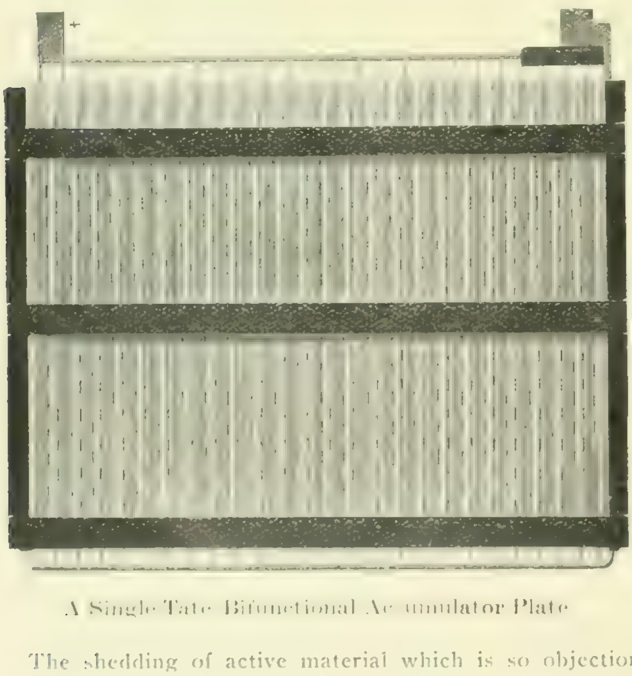
Construction

The bifunctional features of this cell differentiate it from all other present commercial forms, as in one frame are grouped both positive and negative elements, so that each plate in itself when immersed in electrolyte is an active

unit. This is a radical departure which permits of structural rigidity sufficient for battery purposes and yet allows of lateral and vertical expansions and contractions, the whole resulting in a light, compact unit with extended surfaces, subjected equally to the action of the electrolyte and therefore uniformly active.

Owing to the great exposure of surface in compact form, it is permissible to use thin layers of active material capable of comparatively free contraction and expansion without involving local growth, which distorts the ordinary form of grid, and the whole of the material being thus equally active allows of that rapid discharge which is referred to under the heading "Performance," and the expansions and contractions being minute, and not complicated by strains due to pockets of active material, the buckling so frequently met with in heavy discharges should be minimized and possibly entirely obviated.

Next in importance to the mechanical construction comes the question of circulation of the electrolyte and gases. In this type of cell each small pair of elements forms a unit by itself, so arranged in a vertical position and surrounded by a circulating envelope in the form of a duct that the tendency of the electrolyte and gases to rise is not obstructed nor countercurrented, the result being that the flow of electrolyte adjacent to each active surface is maintained uniform by the natural tendency of the gas bubbles to rise and the electrolyte to ascend as its density changes. In other types of cells this natural condition of circulation does not exist to anything like the same degree, as, due to unequal activity and the disposal of the plates, there is a good deal of countercurrenting tending to retain the gas bubbles on the surface of the plates and to restrict the circulation of the electrolyte, thus reducing their action. This superior current action tends also towards the high discharge efficiency indicated under the heading "Performance."



A Single Tate Bifunctional Accumulator Plate

The shedding of active material which is so objectional, not only because of reduction in the capacity of the plates, but also because of the shortcircuiting action at the bottom of the cells if not cleaned frequently, should be greatly minimized by the unique features of construction, and also by the uniform activity of the surfaces promoted by their dimensions and the efficient action of the electrolyte.

Performance

An examination of Messrs. Moore and Scollan's report on performance, indicates a discharge percentage compared with the eight hour rate as follows:—

Capacity for Various Discharges

	Amperes	Amp. Hrs.	Per Cent.
8 hours discharge	4.50	36.00	100
7 " "	5.15	36.05	100
6 " "	6.00	36.00	100
5 " "	6.90	34.50	96
4 " "	8.40	33.60	93
3 " "	10.50	31.50	87.5
2 " "	13.30	26.60	72
1 " "	23.10	23.10	64

In order to determine a comparison between these tests and results obtained elsewhere, we submit below a comparison between three types of cell and the Tate cell, in which column 1 indicates results obtained from a battery of Plante plates entirely; column 2 mixed Plante and Faure type plates; column 3 Faure plates only, and column 4 the results obtained on the Tate cells from the above report:—

Comparison of Discharge Capacities

	Plante	Plante Faure	Faure	Tate
8 hours	100	100	100	100
7 hours	99	97	96	100
6 hours	96	93	92	100
5 hours	93	89	86	96
4 hours	88	83	80	93
3 hours	80	75	72	87
2 hours	70	65	61	72
1 hour	55	50	46	64

These figures have been obtained by considering the 8-hour capacity of the batteries as 100 per cent., and the output at various other hours as percentages thereof. The test indicates that owing to the thin active material, efficient circulation of electrolyte, and uniformity of density over the plates, the Tate battery pasted plate is somewhat the superior even of the uncommercially expensive Plante plates, and therefore greatly the superior of commercial types so far as rate efficiency is concerned.

Moore & Scollan's Report

Along with a more or less detailed description of the design and construction of the Tate battery and of its performance the report contains the following data:—

"Tests consisted in charging and discharging, under careful observation, at various normal and abnormal rates, varying from charging at 4 amperes up to 50 amperes, and discharging at various rates from 4 amperes up to 50 amperes, and finally at short circuit, afterwards charging and discharging again at normal rates.

We wish to mention particularly the performance of the unit on short circuit discharge. This discharge lasted continuously for one hour, starting at over 140 amperes. After 5 minutes the current had not fallen below 100 amperes. At the end of the hour the discharge had reached a minimum of 6 amperes. Within 4 minutes after finish of discharge, the open circuit voltage was 1.51 volts, having risen from 1.38 volts at finish.

This short circuit discharge followed a charge at 50 amperes, which in turn had followed a 50 ampere discharge for 20 minutes. Observations were made every two minutes during these three tests, and absolutely no buckling or distortion took place, and there was no evidence whatever of disintegration or of damage of any kind.

We are of the opinion that the Tate Accumulator is exceptionally well adapted, from both engineering and commercial points of view, for the various fields of storage battery service, whether lighting, vehicle, peak load, isolated plant, or otherwise, and that for these purposes it has inherent advantages, particularly as to length of life, low cost of maintenance and ability to be charged or discharged at high rates, that so far are not to be found in other storage batteries."

Canadian Telephone News

Large Private Telephone Contracts

Several big private telephone contracts have just been closed by the B. C. Telephone Company for the equipment of practically every room of three well known hotels with long distance telephones to replace the existing purely local systems. While the initial contracts only call for the installation of a total of 623 complete phones, it will ultimately mean further additions to the number of between 1,500 and 2,000 instruments, and this is only three hotels. The hotels which are to be given this up-to-date equipment are the Hotel Vancouver and the Hotel Dunsmuir, in Vancouver, and the Empress Hotel in Victoria.

The need of a better long distance telephone service between Montreal and certain outlying rural districts, formed the subject of discussion at a recent meeting of the Chambre de Commerce, Montreal. The members of the Chamber pointed out that at times it was impossible to secure a connection with distant centres. This was especially the case late at night, and at certain hours on Sundays and holidays. This was due to the fact that in many cases the telephone company's agent in outlying places was the local postmaster or some storekeeper, who attended to calls in his spare time. Thus, when the post office or store was closed up, it was only with difficulty that connections could be secured. It was explained by Mr. Jones, the local manager of the Bell Telephone Company, that the policy of the company was to have employees engaged to deal exclusively with its business in all places where there was a sufficient number of telephone subscribers. In other cases, it would be practically impossible for such an agent to be maintained. However, Mr. Jones submitted a list of all places in Quebec and Ontario where the company had a resident agent and where an all-day and all-night service was maintained. This was thankfully received by the chambre as it was pointed out that such a list would be an undoubted convenience to all business men.

Telephone Extensions in Victoria

Additional equipment to provide for the steady growth in the service will be ordered by the B. C. Telephone Company, thus making provisions for about 900 additional telephones. The increase in the demand for telephones has been such that at present there are in operation some 4,200 telephones, an increase of 800 over a year ago. Owing to the lack of accommodation in the present exchange no extensive additions can be made to the plant, but with the new equipment the company will be in a position to take care of all business until the new central exchange building to be erected at the corner of Blanchard and Johnson street, is completed. Tenders have been called for and the contract for the building will be let in a few days.

New Rural Telephone Line

At a meeting of the shareholders of the Laurentide Telephone Company, West Templeton, it was deemed advisable to adcpt the by-laws of the board of directors and make final arrangements with the Bell Telephone Company for connections. The officers elected are as follows: President, Mr. G. W. McElroy; vice-president, Mr. Michael Gahagan; secretary, Dr. Lafortune; treasurer, Mr. T. Watters. It is proposed to begin the erection of the telephone poles just as soon as the frost is out of the ground.

Rural Line in Wright County

Dr. Lafortune, of Gatineau Point, and a number of local business men have organized a rural telephone service which will operate from Quinnville post office, taking in the rural districts surrounding the village of East Hull and West Templeton. The company is capitalized at $15,000, and the building of the line has been commenced. The officers expect to have the service in working order by July 1st. The company will operate over a distance of 21 miles, and have connection with the Bell Telephone company. With this new company and the Eardley Telephone line, which is also of recent origin, the rural districts in the County of Wright are now connected from the Quyon right to Gatineau Point the length of the county

Yearly Depreciation of 7 to 8 Per Cent.

In his evidence before the Public Utilities Commission of New Brunswick, Mr. Howard P. Robinson, director and former manager of the New Brunswick Telephone Company, stated that, in his opinion, a fair allowance for general depreciation in any telephone system would be between 7 and 8 per cent. yearly of the capital cost. Mr. Robinson further stated that the cost per call in St. John city was 7.8 mills, and in other provincial exchanges averaged 9 mills.

Telephone Rates in Spain

Long-distance rates, for conversations of three minutes or fraction thereof, are 9 cents for 30 miles, 22 cents for 125 miles, 40 cents for 250 miles, and 75 cents for 500 miles In connection with the above service a new system has also been inaugurated for the transmission of telephone messages. A 15-word message destined to any point without the province may be sent for 19 cents. Delivery is made on slips similar to telegraph messages in this country.

Must Extend and Give Discount

A bill has been introduced into the Nova Scotia House of Assembly by Dr. Kendall to authorize the Board of Public Utilities Commissioners to compel the Telephone Company to extend its lines to any village or municipality upon the petition of the residents of that locality or request of the municipal or town council. The bill also contains a clause compelling the company to give a 5 per cent. discount on all tolls collected in advance.

A Through Telephone Line

Lethbridge, Calgary and the twin cities of Edmonton and Strathcona are to have a through telephone line for their exclusive use. Four gangs of workmen are now at work putting this through line up. The sixty men employed are under the direction of J. H. Grierson, of Strathcona, superintendent of construction of provincial telephones.

The Central Canada Telephone Company has been granted a charter by the Ontario legislature which gives the company the right to do a long distance business in the cities of Fort William and Port Arthur. The bill gives the company the right to operate a telephone business and to build a line from a point at, near or in the city of Port Arthur to the Manitoba boundary and east through the district of Sudbury.

The Ontario Railway and Municipal Board has issued a warning to the telephone companies which have not yet filed their tariffs with the board for approval, as required by the Telephone Act passed last year. Operation of a telephone company before the tariff has been filed and approved is illegal.

The Lanark and Carleton Counties Telephone Company which already has about 150 subscribers, is said to have received applications for extensions during the coming summer, which if installed will practically double this number.

Plant of the Erindale Power Company

A Power Plant of Unique Design—900 foot Underground Water Channel—A.C.B. Generators — Canadian Turbines - Ferranti Switchboard — 2500 h.p. available

A cleverly designed little power plant has just recently been placed in operation on the Credit river at Erindale village, three miles up stream from Lake Ontario and about 14 miles due west of Toronto. This plant was originally designed by the old Southern Light & Power Company, and was being financed by the defunct York Loan Company at the time of the latter's declaration of insolvency.

Some two years ago the property was taken over by the Erindale Power Company under the management of Mr. E. S. Edmondson. Since that date record progress has been made and in August of 1910 the first generator was placed in commission. A second generator has now been added and everything is ready for the installation of the third and last unit which will be placed in position as soon as the demand for power and light warrants it.

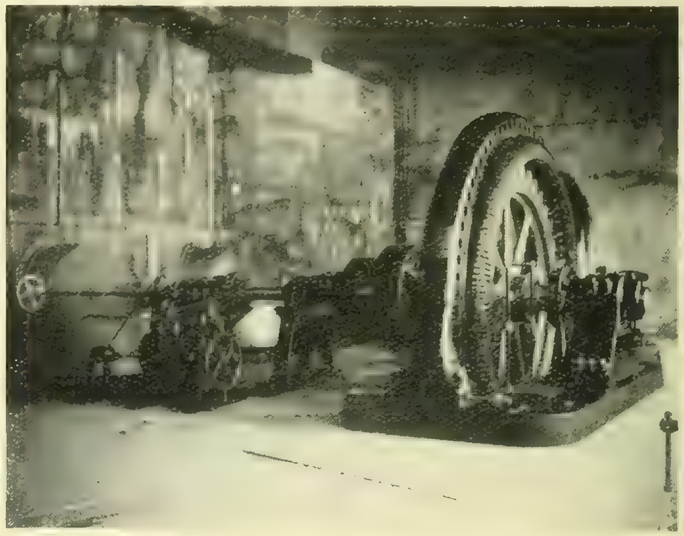
The Water Supply

At Erindale village the Credit river takes a sharp turn and doubles back on itself within a length of little more than half a mile, passing over, at the same time, a series of rapids representing a total fall of some twenty-five or thirty feet. Up stream a further series of rapids formerly obtained and the river was enclosed by high, wide banks well suited for storage purposes. A concrete dam has been constructed at this midway point, some 34 feet deep, above the river bed (the foundation being carried 20 feet below the river bed to the rocks, thus creating a storage area of upwards of 100 acres. This forebay is connected by an underground tunnel, through the narrowest neck of the peninsula, with the power house located on the river's bank below.

Exterior Power House - Erindale Power Co.

The large diverting dam is constructed of reinforced concrete and is some 700 feet in length. A 100 foot spillway with three 6-foot stop-log sluiceways occupy the central portion of this structure. The spillway is in two sections, as shown in one of the accompanying photographs with strong reinforcing butresses in the middle and at each end, the latter heavily supported by staunch wing walls. The wing dams, lying to the right and left of the spillway, are concrete cored, with concrete cross wings averaging every 25 feet. (See figure of dam). These concrete cores are 8 feet wide at the base gradually narrowing to 16 inches at the top. Large quantities of earch and rock fill support the wing dams on both up-stream and down-stream sides. Extensive excavations were made for the concrete work which rests at every point on a solid rock foundation.

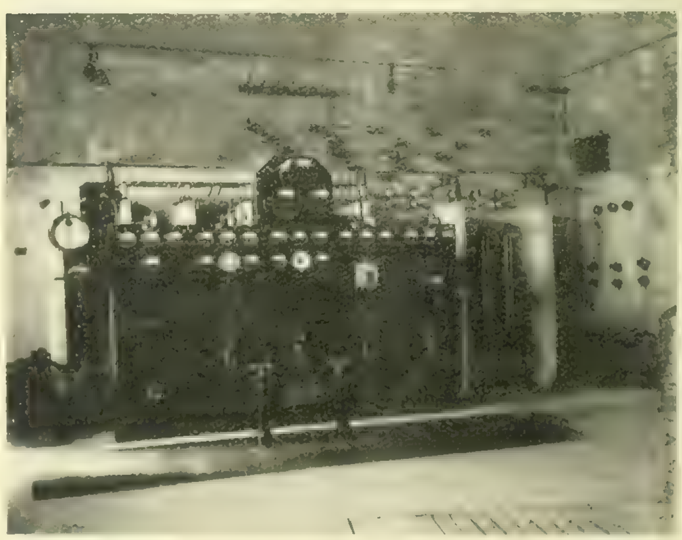
The intake is a concrete crib about twenty feet square, situated some distance up stream from the dam and equipped with head operated gates, stop-logs and wooden rack. The water-channel is wholly undeground, 12 ft. 6 in. in diameter, 900 feet long and lined with heavy reinforced concrete. This tunnel is horse-shoe shaped and has a drop of 1 ft. 6 in. in the 900 feet.



Two Operating Generators Erindale Power Co.

The Power House

The power house is located about 200 feet from the river and on the side of a steep bank, so that the bulkhead, which is a part of the power house building proper, is set right into the bank. The design of the bulkhead is quite unusual, as shown in one of the photographs and in the horizontal



Ferranti Switchboard Erindale Power Co.

700 foot Dam across Credit River, forming a 60 foot head—Erindale Power Company.

cross-section of the power house. It consists practically of four compartments: a main section containing the steel racks, feeding three smaller sections which project downwards to a level with the power house floor and correspond in fact to vertical penstocks. The main section of the bulkhead is supplied with a spillway closed with stop-logs, in case of water surges, and each of the three smaller sections may be shut off by hand operated gates. These were not installed when the photograph was taken.

Unusual care was observed in the reinforcement of the bulkhead and especially of the vertical concrete penstocks. In the latter, ⅞-inch iron rods placed horizontally encircle the penstocks every four inches, interlocking at each turn with the corresponding ring of the next penstock. In addition to this, heavy mesh reinforcement was installed on edge encircling the penstock, with ¾-in. steel and old rails vertically, and the face walls are 28 inches thick.

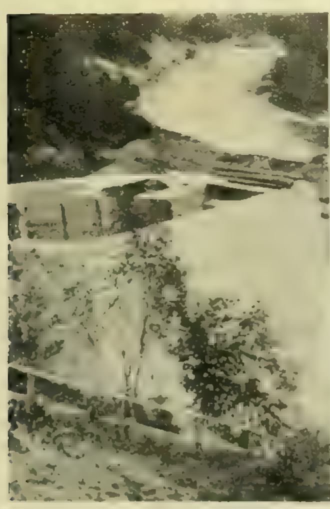
The turbines are single runner, centre discharge, type, the well-known "Canadian" turbine manufactured by the Chas. Barber & Sons, Meaford, Ontario. Two of the turbines, rated at 1,000 h.p. each, are now operating and all construction work necessary for the installation of the third unit is completed. The arrangement of the draught tubes and the discharge tunnel (all concrete structure) is shown in the vertical cross-section of the power house shown herewith.

The generators are Allis-Chalmers-Bullock manufacture, 3-phase, 60 cycle, 36 pole, 200 r.p.m., 13,200 volts, 600 kw. capacity. These generators are 14 feet diameter, 16-foot base and were the main determining factor in the polygonal shape of the power house. The generators are sets over pits 7 feet deep. These are all connected together forming a cable runway to the switchboard shown in the vertical section.

A feature of note in connection with the A.C.B. generators installed, and one which speaks well for the quality of insulation used by this company, is the fact that although the generators stood outside just as they came from the shop, for over four years, not a coil broke down. In drying out a bridge megger was used with excellent results. At the start the insulation resistance was so low that the instrument would not record it, but after running on short circuit with 150 per cent. full load current for 195 hours, a reading of 8 megohms was obtained. This was continued till a final reading of 150 megohms was obtained at the end of 315 hours.

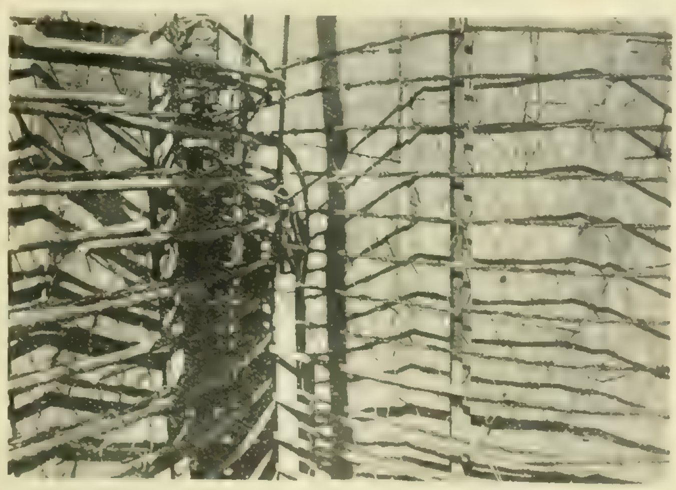
The exciters are A.C.B. type, belt driven, 60 kw. capacity. Two are installed, either one capable of exciting all three generators. The governors are Woodward manufacture. Each turbine operates its generator through a flexible clutch.

As current is generated at 13,200 volts no step-up transformers are required, transmission being at that pressure. The switchboard is Ferranti manufacture, 5 panel, slate. In the rear of the switchboard cement compartments contain: (1) a small balancing transformer for operating the oil switches; (2) and (3) oil switches between the generators and busbars; (4) and (5) oil switches between the busbars and the main line; (6) lightning protection apparatus and (7) a pair of small 13,200/2200 volt transformers for local service.



Top View of Concrete Bulkhead.

Entrance to 900 foot Tunnel.



Reinforcements in Vertical Concrete Penstocks.

The power house is lighted by twelve 250 watt tungstens with holophane reflectors. All wiring is in conduit. A hand operated ten-ton crane operates on a track running the length of the power house.

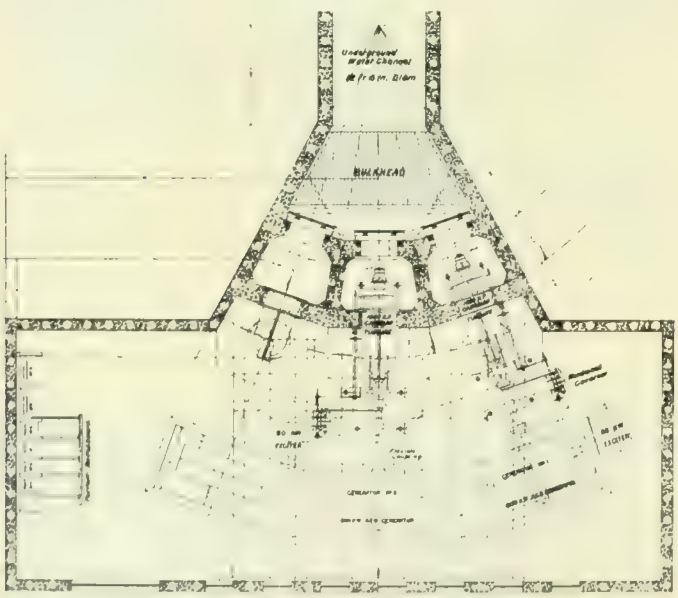
Transmission and Distribution

Provision is made for a double line, to be carried by the same poles, but only one is yet installed. The distribution of light and power is in the hands of a second organiza-

Construction Work—Erindale Power Co.

tion, the Interurban Electric Company, though both companies are under the management of Mr. Edmondson and of the same engineer, Mr. Thomas Henry. As stated above transformers situated in the generating station supply local requirements, chiefly the lighting of Erindale village.

The main sub-station is at West Toronto, but two branches leave the main line before this point is reached; one to New Toronto where a sub-station, containing three 200 kw. 13,200 to 2200 volt transformers, serves the New



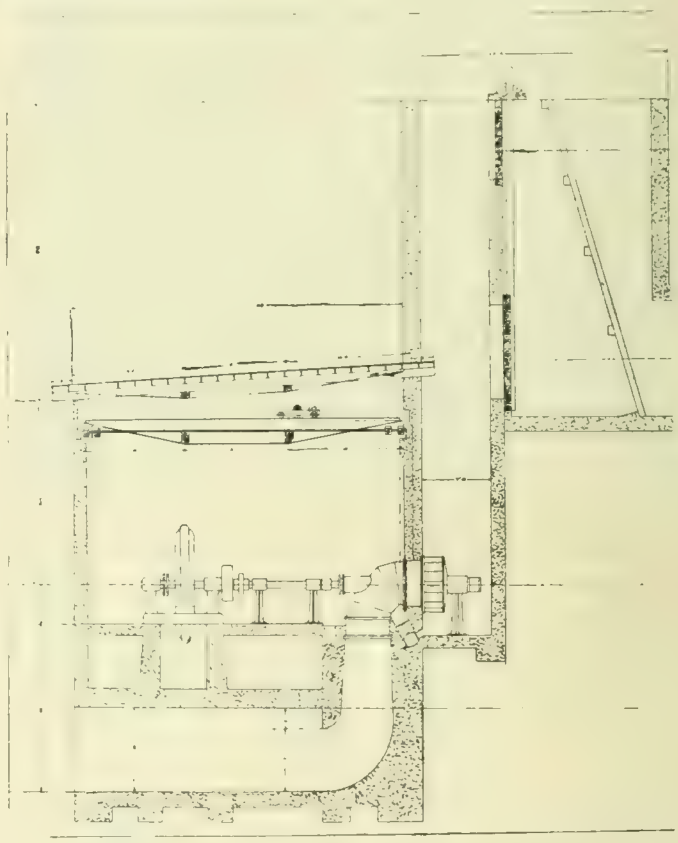
Horizontal Section Power House

Toronto, Mimico and Long Branch district; the other to Swansea to supply the Canada Nut & Bolt Works. This latter station contains two 250 kw. 13,200/220 volt, Scott connected transformers.

The West Toronto station contains two 300 kw. transformers, Scott connected to change from three to two-phase. The incoming lines carry expulsion type fuses and lightning protectors of the Garton-Daniel spark-gap type. This station is also equipped with a 300 kw. 2200 volt rotary condenser for keeping up the power factor and helping the regulation. The low tension busbars in this station are also fed from the Humber generating plant of the same company where 900 kilowatts are generated by 4 units at 2200 volts, two-phase. From the low tension busbars West Toronto's light and power needs are served and lines pass in various directions to Lambton, Islington, Bracondale, Wychwood, Deer Park and North Toronto.

Power Rates

The power rates offered by this company run as low as 2 cents per kw.h. with a minimum charge of $15 per h.p. year; they also sell at ½ cent per kw.h. with fixed charge of $12 per h.p. year where power is taken in fairly large quantities. The house lighting rates have been 6 cents per kw.h. with monthly meter rental of 25 cents. Following the lead of the other systems operating in Toronto the



Vertical Section, Power House and Bulkhead

meter charge may now be removed, in which case Toronto's western suburbs will be receiving power and light at more favorable figures than almost any other Canadian town.

The generating plant at Erindale and the more recent extensions to the distributing system have been designed by the chief engineer, Mr. Thomas Henry, and constructed under his direct supervision. Mr. Henry is now chief engineer in charge of the operation of the whole system which is similarly combined under the management of Mr. E. S. Edmondson.

Messrs. S. Pearson & Sons' successors, of Mexico, have just placed an important order for the delivery of six water turbines of 9,700 h.p. each, with the well-known engineering firm of Messrs. Escher, Wyss & Co., of Zurich, Switzerland. The turbines are destined for the Santa Rosalia power plant on the Conches river, Mexico, and are of the double Francis type, designed for working under a head of about 150 feet with a speed of 360 revolutions per minute, and will be fitted with Escher, Wyss & Company's latest designed oil pressure governors. The order further comprises two 450 h.p. exciter turbines with governors.

Electricity on the Farm

During the past few weeks the Hon. Adam Beck, Chairman of the Hydro-electric Power Commission of Ontario, has been explaining to the farming communities the various advantages to be derived from the use of electric power, and has been demonstrating the ease with which power may be delivered in the vicinity of the high tension lines.

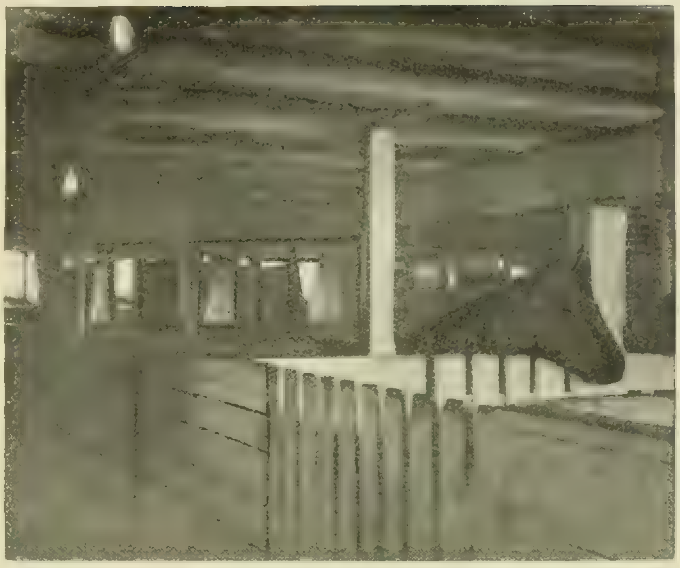
The use of electric power by farmers will probably be an assured fact in the next few years and in this connection it is interesting to note that there is one installation already

Pole Line Carrying Power and Telephone Wires

in operation on a farm near Preston. This is on the property of Miss Wilks, the well-known breeder of high-class stock. A view of one of Miss Wilks' barns and also of the pole line carrying the wires is shown. Current is taken from a 2200 volt line fed from the Preston sub-station, at a point in the neighborhood of Blair, about one mile from Miss Wilks' buildings. A 5 kilowatt 25 cycle step down transformer similar to the ordinary street transformer reduces the current here to 110 volts, at which it is carried along the same pole line with private telephone wires to the barns shown. The wires are led in to the barn through iron conduit.

The interior wiring consists of seven different circuits feeding in all forty 35 watt tungsten lamps. These are chiefly in the basement, but sufficient lights are run upstairs in conduit, over the main floor to supply light for evening work if necessary. The cutouts, main switches, etc., are installed in an iron cabinet and kept under lock and key. The animal seen in the interior view shown represents

One of Miss Wilks' Barns where Niagara Power is used



Interior Basement Lighted by Niagara Power

a full sister of Dan Patch being nourished by the light of a number of modern tungstens.

There is nothing in this installation, of course, which is beyond the reach of any farmer as far as expense is concerned, and there can be little doubt but that this method of lighting the houses and barns of those farmers who are fortunate enough to reside in the vicinity of any hydro-electric distribution line will in the very near future be resorted to.

To Miss Wilks, so far as we can learn, belongs the honor of being the first farmer to install Niagara Falls electric power, and she is to be congratulated on her progressive

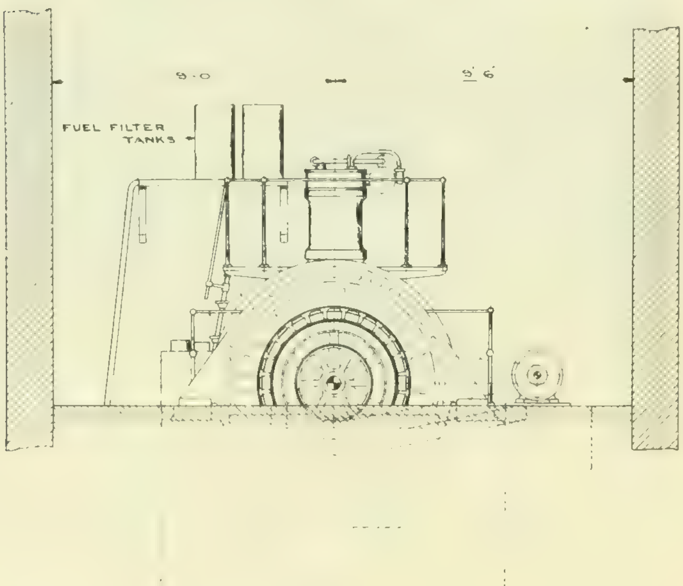
Mr. Jos. Deemert, Electrical Contractor

attitude in connection with modern farming as is also Mr. Joseph Deemert, of Preston, the electrical contractor who had charge of the installation throughout.

The American Conduit Company announce that they have just received an order through the Northern Electric & Manufacturing Company, of Winnipeg, for 60,000 feet of bituminized fibre conduit for shipment to Regina.

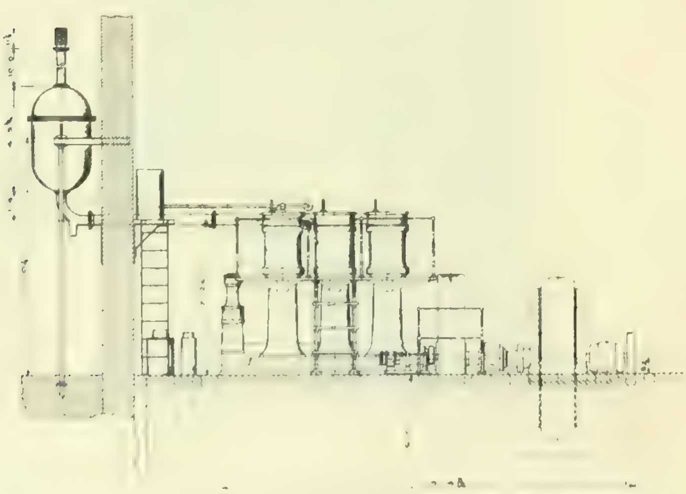
A Crude-oil Generating Plant being installed in Yorkton, Sask. for Light and Power

The accompanying diagrams illustrate the layout of the electric generating system now being installed by the town of Yorkton, Sask. The engine is being built by Messrs. Mirrlees, Bickerton & Day, of Stockport, England, and is of the standard three cylinder 250 r.p.m., 150 h.p. type. In this particular installation, owing to the altitude of Yorkton, and also to the fact that the engine will run at the reduced speed of 240 r.p.m., to suit the periodicity of the al-



ternator the horse power will be reduced to 132. The alternator is Siemens Bros. manufacture an 80 kw., 60 cycle, three-phase, 2200 volt machine, the exciter being belt driven as shown in the second diagram.

The advantage claimed for this type of prime mover is its economy in operation. With oil at 10 cents a gallon in Yorkton it is believed that the total expense will not exceed 1¼ cents per kw.h., this to include fuel, lubricating oil, waste, water, stores, wages, repairs, and maintenance. In Ontario and other parts where oil can be bought for 3 cents



a gallon, these costs would be reduced to something like ¾ of 1 cent per kw.h. on the switchboard. The oil used is what is known as fuel or gas oil, having a specific gravity of from .8 to .9 and a heat value of between 18000 and 19000 B.t.u. per lb.

Two engines of the same make are being installed in Moose Jaw for street railway service. These are 4 cylinder, 184 h.p., direct connected to two Westinghouse 125 kw. d.c. generators.

Electric Railway for Lethbridge

Mr. Arthur Reid, superintendent of the water and electric light department for the city of Lethbridge, has recently returned from an extended trip through the eastern States and Canada, where he has inspected a number of the most up-to-date electrical installations and manufacturing plants. Mr. Reid reports that Lethbridge's combined pumping and electrical installation, which has been in service about a year, has proved very satisfactory, both from an engineering and from a financial point of view, so much so in fact that considerable additions are to be made to the plant in the near future, and an electric street railway system is to be installed and operated by the city.

Legal Notes

Doolittle vs. Town of Orillia

Action by plaintiff to recover $5,000 damages for flooding his lands, alleged to have been caused by the erection by defendants of a dam at the Ragged Rapids on Severn river, for the purpose of supplying and furnishing electric power for lighting and other purposes in the town.

Middleton, J., at the trial dismissed the action with costs.

Divisional Court held, that the evidence did not show beyond reasonable doubt, that the dam was the cause of flooding plaintiff's lands. Appeal dismissed with costs.

Waddington vs. Toronto & York Radial Railway Company

The Ontario Railway and Municipal Board held, that this street railway company having a franchise for only a single track, the board has no power, under 10 Edw. VII. c. 83, ss. 9, 10, to order the company to double track. To do so would be, in effect, to give the company a different franchise than that which had been granted by the municipality.

Recent Canadian Patents

The following is a list of recent patents granted by the Canadian Patent Office, relating to electrical arts, and furnished by Fetherstonhaugh & Company, 5 Elgin street, Ottawa, Canada:

131,594—C. G. Marden, Brooks Mairel, potato cutters. P. C. Klein.

131,611—H. Schandein and M. P. Lind, Philadelphia, Pa., folding display boxes.

131,618—P. Burger, New York, fixtures.

131,620—J. H. Burland, Montreal, Que., display devices.

131,624—Chas. W. Davis, Edgeworth, Pa., terminals for electric cables.

131,625—Chas. W. Davis, Edgeworth, Pa., terminals for electric cables.

131,626—E. G. Goddew, Hampton, near Melbourne, Victoria, Australia, electro mechanical selectors.

131,745—E. V. Banks and R. W. Pike, Toronto, Ont., illuminated advertising devices.

131,774—A. Helfenstein, Vienna, Austria, methods of utilizing the gases resulting from reduction operations carried out in electric furnaces.

131,775—H. Weise, Hexon, Philadelphia, Pa., electric furnaces.

131,829—Jas. H. Reid, Newark, N.J., electric smelting and refining apparatus.

Questions and Answers

Effect on Wattmeter of Varying Voltage

Q.—If a watt meter were installed on a service where the voltage was 100, what effect would the lowering or raising of the voltage have on the wattage recorded on the meter?

A.—Theoretically, a watt-hour meter, assuming that you refer to an integrating instrument, will record the exact energy which passes through it, irrespective of any change in the voltage, up or down, and irrespective of whether the instrument be direct current or alternating. Practically, though, there is a limit, both up and down, beyond which any instrument tends to have serious errors, the tendency in both cases if the variation is wide, being to run slow (at very low voltages because of the low torque of the meter, and consequently greater effect of friction, at abnormally high voltages because of over-saturation and magnetic leakage and heating). Under variations not exceeding (say) 10 per cent. either way from normal the error in a meter of modern reliable make, either commutating or induction, will not be very marked, about 1 per cent. to 2 per cent.; it may run fast or it may run slow, depending on the particular meter involved. Direct current meters, as they possess no iron, are somewhat more accurate on large temporary over-voltages than the induction type, though in both forms the question of heating has to be considered when dealing with potentials that steadily remain very materially above normal.

A.C. Ammeters with Current Transformers.

Q.—Why are alternating current ammeters always built with current transformers when not inserted directly in the line; would it not be cheaper to build them with shunts?

A.—Ordinarily speaking a shunt will be cheaper than a current transformer, except in the case of fairly large currents, when the skin effect in the shunt would probably make the latter very expensive, and also very cumbersome. (Skin effect is the tendency of an alternating current to flow only in the outer part of a conductor, instead of being distributed equally all through it, as in d.c. work. It is especially noticeable when working with large conductors and currents.) Besides this, the skin effect introduces inaccuracies, these being further augmented by the large errors that would occur for even a slight change in frequency, due to the combination of a resistance in parallel with a reactance, such as the coils of the instrument actually are.

Generator Leads Grounded.

Q.—(a) I started up one of our generators one night last October and discovered that one of the leads was grounded. This lead is lead covered, rubber insulated. I had this machine in operation a few days previous to this occasion and everything was O.K. I cut the lead sheath in several places and tested the cable with a magneto, which is the only apparatus we have for testing, and I obtained a slight ring between the wire in the cable and each section of the lead sheath. Would the cable be charged as a condenser, and if so, what would have caused it to become charged, and what would be the remedy?

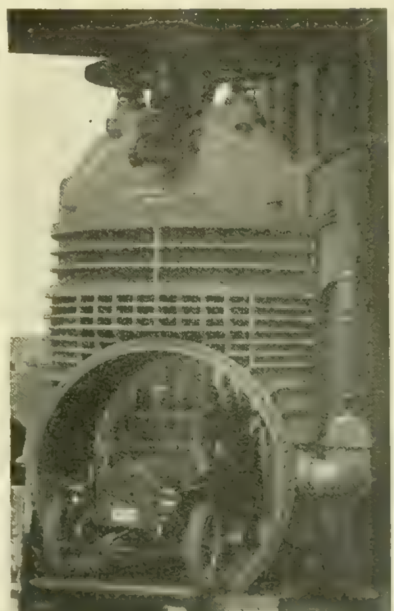
(b) About half an hour previous to starting this machine we had a thunder storm which put our second machine out of business. I can't see how that would effect the leads of this machine. The machines are 10,000 volts, 3-phase, 60 cycles.

A.—(a) While there would certainly be some condenser action under such conditions, it would seem more likely that the ringing of your bell was due more to leakage than to condensance. About the only precautions necessary in cable installations of this kind, assuming of course, that the insulation of the cable is suitable, are to ground the lead sheath, and to equip it at both ends with cable bells. On long cables, particularly if the voltage be high, it is generally found desirable to equip both ends with a relief valve for the static charges, the aluminum lightning arrester being perhaps the best device for this purpose. The short cables used in power house work do not as a rule require the precaution.

(b) We can offer no suggestion as to the cause, assuming the second machine to be disconnected from everything at the time. Of course, if the machines were parallel you are just as liable to have trouble in two as in one, because the potential surges produced by a short circuit in either one are frequently serious enough to break down the other.

A Nine-foot Valve

The cut shown herewith represents one of the three valves manufactured by the Chapman Valve Company, of Springfield, Mass., for the Ontario Power Company, of



Niagara Falls, Ont. The valve has a 108 inch opening, weighs 132,000 pounds, and is operated by a 15 horse power motor controlled from a distant station.

Profitable Public Ownership

In the past ten years the city treasurer of Hull, England has received from the profits of the municipal street car system over $700,000, which has lessened local taxation by just that amount. This is after paying all operating expenses and interest charges, keeping the system in first-class order, and adding a stated amount annually to the sinking fund.

The net profits in the fiscal year ended March 31, 1910, were $111,647, and $77,864 was set aside for the relief of taxes; in 1909, with net profits of $130,646, the sum of $87,597 was devoted to tax relief.

There are no fare zones. The fare is 2 cents, which carries a passenger from one end of the line to the other, and in the morning hours the charge is only 1 cent. Notwithstanding these cheap rates the Hull street cars under municipal ownership and operation each year show a profit.

The Stromberg-Carlson Signal System

By C. P. Button.

The Stromberg-Carlson Despatcher's Signal System is a physical measure of safety used in connection with written train orders. Its conspicuous and substantial manner of commanding respect does not permit of its being considered second in importance even to a train order, for it is much easier for a motorman to momentarily forget a train order than it is for him to run past a full sized standard semaphore signal set against him.

Strictly speaking a despatcher's signal cannot be termed a block signal, nor is it an automatic signal, but by reason of the fact that its principal function is to prevent head-on collisions it is not infrequently referred to as a block signal.

A despatcher's signal is a standard semaphore controlled electrically by the train despatcher. Such semaphore is located at each siding or turn-out. The value of such a signal system is that it furnishes a means of enforcing obedience to written orders, not lessening in the least the responsibility which rests upon the train crew for the execution of the orders given.

It has been, and is, the approved and best practice to issue train orders on what is known as the double order plan; each crew concerned receiving an order worded in identically the same manner. If the crews intrusted with these orders would be faithful to the trust the need of additional protection would not be apparent. Such it not the case, however, and because of this fact it is plainly necessary to provide some means of reminding the crew of their orders.

A train despatcher on what is known as a steam road, has an operator at practically every siding which enables him to place himself in communication with any crew on the road, but the despatcher on an electric road labors under very a great disadvantage in this respect in that he is not able to initiate communication with the crews except in such few cases as he can anticipate and provide for. There should be a man or a semaphore whose arm the despatcher could command to stop a car at each siding on the road, otherwise a one-sided arrangement exists, and an electric road with neither man nor semaphore subject to despatcher's command is not putting its telephone system to the fullest possible use, hence an actual loss on the telephone investment of approximately fifty per cent.

For the purpose of explanation, the apparatus may be divided into two general classes, the master station equipment and the local station equipment. The master station equipment, as its name would imply, is located in the train despatcher's office and consists of selector, selector key or switch and tape recorder. The local station equipment consists of selector, trip and repeat-back mechanism. In addition to the above there is located at each siding a standard semaphore.

The underlying principle upon which the selector is based is time and distance, that is, in each selector, both master and local, there is provided a standard clock work controlled by a pendulum escapement and driven by a large weight.

It is a well known fact that a pendulum of given length always maintains an exact rate of vibration when supplied with the necessary power to move it.

As all clock works start from a zero or normal position it follows that any hand or arm attached to same will always move a given distance in a given time, and since all local station clocks are necessarily adjusted to the master clock it is obvious that similar distance may be selected to suit any possible requirement within the range of the movement allowed. Hence if all clocks were in motion at their normal zero position and all are released at the same instant it is possible to have the master and the first local clock coincident at the predetermined interval of three seconds; the master and number two local at an interval of six seconds, etc., to any number of stations that might be required. Hence if it is desired to operate the equipment to any desired station it is only necessary to cause the closure of an electric circuit at a predetermined time which is common at the same instant in both master and local clocks. It is obvious that no other clocks are at the proper position since the interval of each of the other clocks is shorter or longer than the preselected one and their electric circuits are not closed at that instant.

The semaphore is of a standard gravity type, the arm of which is held in normal clear position and when released by the electrically controlled trip gravitates to danger or stop-position.

The system operates from current sources located at the master end of the line, only one source of current is used; no battery or current supply is required at any of the local stations for any purpose; thus eliminating the trouble and maintenance of local batteries entirely, as well as concentrating the power to one place where proper supervision may be maintained.

The care of the system is very small and as faults are indicated almost at once and are observed by the directing head of the road, immediate attention is called to the trouble and necessary steps for the proper operation of the system would naturally follow.

For purposes of safety and practicability, every interurban road will in their regular time-table provide for all train movements that can be anticipated and it is a comparatively rare occurrence for head-on collisions to occur through disregard of time-table meeting points.

The statement has been made time and again by railroad officials and borne out by occurrences that it is the unusual meeting point provided for by train orders which brings disaster in the majority of cases. It is not strange that this is the case, for two crews meeting at a certain siding day after day do so quite mechanically, and when a disarranged schedule necessitates the creation of a new meeting point by the despatcher trouble is liable to creep in. A trained employee is asked to break away from a practice, a custom. The employee must cast from mind all that he has been doing mechanically and adhere to the new order of things which means that he should meet at the unusual meeting point. It is therefore not so strange that oft times one of the oldest employees, longest trained to custom is quite frequently the one who forgets and heads for the regular meeting point instead of waiting at the siding nearer at hand; the unusual meeting point named in the order.

Where despatcher's signals are installed the order of procedure is as follows: when a situation arises which necessitates the issuance of an order by the train despatcher for two cars to meet at a certain siding, the despatcher, preliminary to issuing the order, sets the semaphore to danger or stop-position at the selected meeting point. Instantly the particular signal operated will automatically send forth impulses on the line in the form of interruptions, which in connection with the tape recorder mechanism, will perforate the number of the signal operated on a piece of paper issuing from the despatcher's tape recorder. This re-

cord is made before the eyes of the despatcher so that he has positive assurance that the signal at the particular siding selected has actually operated to full danger or stop-position. The first crew of the two referred to when approaching the siding named in the train order, the unusual meeting point, will find a standard semaphore arm by day and a large red light by night commanding them to stop. The crew calls the despatcher by telephone and the despatcher reminds them of the order already in their possession to wait there for the opposing car. He also instructs the crew to restore the signal to normal or clear position, so that only the first crew to arrive at the meeting point is called upon to restore the signal to clear.

In placing the orders in the hands of the crew the despatcher also uses the signal as a facility, for as soon as a consistent meeting point is determined upon the train despatcher sets the signal against the two crews concerned at such convenient point as will most quickly bring him into telephonic communication with the two crews desired.

The only difference between the method employed by the electric road despatcher and the steam road despatcher being that the despatcher on the electric road uses a signal and places himself in personal communication with the crew, whereas the steam road despatcher communicates with the operator at the different sidings and issues orders to the crew through the aid of the operator.

The Reason Why of the Western Pole

By C. P. Lindsley.

The problem of buying poles would not seem a hard "nut to crack" if it were left to the pole producer, but for some reason, leaving out the variations in the price, there seems to enter into the problem a question of more or less moment.

The reason for the western pole is this: In the year 1899, the Bell Telephone Company were contemplating the entire reconstruction of their many exchanges throughout the States of Michigan, Wisconsin, Minnesota and Texas. It was an immense task and involved the expenditure of a vast sum of money, and the feature of securing sufficient long poles to remodel the exchanges in so many large cities was a problem. We became aware of this condition and a hurried trip to the Pacific coast revealed to us the possibility of landing this immense order, and if the then existing freight rate could be reduced we would be able to introduce the "western pole" into the east at a figure that would be attractive. There were no poles manufactured, but we saw them standing in the bush and we knew they could be gotten out with a little energy. We hammered the freight rate down point by point from 75c. to St. Paul to 40c. on promise of six hundred loads of poles in four months. We got the order. We shot poles into Texas, Michigan, Wisconsin and Minnesota "hot and fast." The west was very new. Our trials were many, but we "made good." Our order was for 9,000 50-ft. to 70 ft. poles to be shipped in four months. Before this order was filled an order for 16,000 long poles was literally forced upon us for the Bay Counties Power Company, of San Francisco, Cal., to be shipped inside of five months. This was to construct the longest electric power line in the world, 245 miles long, from the Sierra Nevada Mountains to Oakland, California. We "made good" again.

It is needless to say we needed an organization to accomplish these results. We were "pioneering." The car supply was not what it should have been. There were few roads built. Settlers were few and far apart. We persevered and struggled through this and with it the obstacles we had to contend with in getting eastern buyers to believe in western poles. "Knockers" were numerous, for the eastern pole dealer was alive to his own interests. We, however, had not finished our operations in the east and were in the "running." We were confronted with the fallacy that western poles would not last as long as eastern poles. There was no foundation for this, for no one knew whether they would last or not. They had not been tried, but some believed it, nevertheless, others did not.

C. P. Lindsley, President, The Lindsley Bros. Co.

E. A. Lindsley, Vice-President, The Lindsley Bros. Co.

Twelve years have passed and this old "bugbear" has

escaped. The knockers have ceased knocking. Those at least with good common sense have. Five years ago we began introducing British Columbia poles. We met with the same opposition. We have "kept at it." Pushed British Columbia poles into nearly all the large cities of Ontario, Quebec, Manitoba, Saskatchewan and Alberta. Mr. McKenzie, of the Winnipeg Street Railway Company, in a personal conversation with the writer, frankly said that the subject of the longevity of the western poles as compared to eastern poles had been pressed upon him frequently, but his reply was a simple reference to a line of western poles that had been in the ground fifteen years and they were only decayed at the ground line to the depth of the sap wood, which is one-half inch, and they were in just as good condition as Rainy Lake or Minnesota poles set at the same time. In Minneapolis the same holds true. From a letter from Mr. Dayer stating to us that poles we shipped them eight years previous had to be removed and he found them in an excellent state of preservation, only the sap wood at the ground line being rotted. We can go on reciting from several others with equally as good testimony to the lasting qualities of our poles.

Our British Columbia operations extend over the entire Kootenay district with headquarters at Nakusp, where we have a large yard supplied with poles brought from all points around the Arrow Lakes by rafts and stored in our yard until they are thoroughly seasoned. We have several other yards throughout the province.

Our organization is complete. Our inspectors are all competent men who have been in our employ for years and we trust them to ship nothing that will bring discredit to our reputation as shippers of first-class poles.

Our poles are now so well introduced that they can be seen in nearly all parts of the Dominion of Canada, and where they can be seen or examined they need no further endorsement. Our motto is—"Good Poles Shipped Promptly."

New $100,000 Company Formed

The Canadian Knowles Company, Limited, who have built up an extensive and successful business during the past year, will be succeeded by The Masco Company, Limited, which company will also include the well known engineering concern of McLean & Peaslee. The name of the company is derived from the first letter of the names of officials and interested parties, i.e., Morgenstern-Anderson-Shannon Company, and gives a very good advertising trade mark derived from the word "Mascot," meaning good luck. The Masco Company, Limited, also signifies Mines & Smelters Company.

The officers of the company are: President, Chas. M. Shannon, of Los Angeles and New York city, well known in connection with the Shannon copper interests of Clifton, Arizona, one of the largest producing copper mines in existence. Mr. G. H. Morgenstern, vice-president and general manager, formerly held same office with the Canadian Knowles Company, Limited; Mr. Henry S. Anderson, treasurer, formerly manager of the Shannon copper interests at Clifton, Arizona, was previously with the Stone & Webster Company, and the Westinghouse Electrical Manufacturing Company. Mr. Anderson will be permanently located in Toronto and actively interested in the business. Mr. Chas. L. Betterton, Victoria, B.C., director, is a prominent capitalist and interested very extensively in British Columbia. Mr. Grayson Burruss, director, Toronto, of the well known firm of Burruss & Sweatman, Limited.

In addition to a large line of electrical specialties to be handled by The Masco Company, Limited, in behalf of a number of American manufacturers who they represent exclusively, the company will carry a complete stock of staple electrical apparatus and supplies at its Toronto warehouse, and just as soon as necessary warehousing arrangements can be completed, will stock mining machinery and supplies extensively. The company propose to establish sub-selling and stock branches in Montreal, Winnipeg and Vancouver during the year, which offices will be in charge of competent management.

The authorized capital stock of the company is One hundred thousand dollars ($100,000), all of which has been subscribed for by American capital with the exception of a limited sum held by Canadian officials.

It is the purpose of the company to start manufacturing in Canada just as soon as the market for its specialties is built up to this sufficient proportion, and is otherwise advisable. The sales department will be under the management of Mr. A. S. L. Peaslee, formerly of McLean & Peaslee.

The Masco Company, Limited, has been awarded the contracts for printing press motors for the installations at Massey Harris Company, Limited, private printing plant, Gerlach-Barklow Company & The Charles Press. The apparatus department of the Masco Company is under the management of Mr. McLean, late of McLean & Peaslee and Canadian Westinghouse Manufacturing Company.

New Appointment

Mr. M. G. Young has been appointed engineer of The Packard Electric Company, Limited. As an engineer and designer Mr. Young has had exceptional experience in developing and manufacturing transformers and other electrical apparatus. A graduate in electrical engineering, he has been for the past ten years on the engineering staff of the General Electric Company at Schenectady, the last eight years in charge of design and manufacturing cost of transformers. During this time he has had to do with the design, development and manufacture of every class of transforming apparatus built by that company up to 10,000 k.v.a. and voltages up to 110,000. In 1909 he was sent by the General Electric Company to the Allgeineine Elektricitals Gesellschaft of Berlin, Germany, to study the designs and shop methods of that company in the manufactures of transformers, spending fifteen months there, and returning to the General Electric Company last May, since which time he has been engaged in reviewing their latest

Winnipeg Notes

Mr. J. H. Schumacher, who has recently accepted the position as manager of the Mitchell Gray Electric Company, is a graduate of the University of Minnesota, and before coming to Winnipeg was employed for five years by the W. I. Gray & Company, as construction engineer, and by the Minneapolis Electric Equipment Company for one year as construction manager, and has been for the past two years with Chas. L. Pillsbury, consulting engineer, Minneapolis and St. Paul, as electrical engineer. Mr. Schumacher is an associate member of the A. I. E. E., and a member of the Illuminating Engineering Society.

The Mitchell Gray Electric Company have been awarded the contracts for the wiring of the Trust and Loan Building of Canada in Winnipeg, and the new Canadian Northern Railway Hotel in Brandon.

Constable J. Beatty, of the Winnipeg police force, was electrocuted while searching in the ruins of a burning house on April 14th. His hands, clothing and the ground were thoroughly soaked with water and formed a good circuit for the low voltage circuit, which is supposed to have killed him.

Industrial Progress and Trade Notes

Weston Switchboard Wattmeters

The Weston Electrical Instrument Company has recently placed on the market a complete line of alternating current switchboard instruments, among which is a group of single-phase and polyphase indicating wattmeters. These wattmeters are of the Weston Electro-dynamometer type in principle, but their construction is new and they possess numerous unique operative characteristics.

Among the unique characteristics claimed by the makers the following may be mentioned: Uniform scale; equal accuracy on direct-current circuits and alternating-current circuits without change in calibration or reversal of leads; substantially the same ease of reading on fluctuating as on steady loads; accuracy within 1 per cent. for variation of frequency from 15 to 900 cycles per second, of temperature from 50 deg. F. below to 50 deg. F. above normal, of power-factor from 0.50 lag to 0.50 lead and of wave form within the range of ordinary commercial practice.

The general excellence of the construction, the simplicity of the design, and the accessibility of the parts are indicated in the accompanying figures, which represent a single-phase instrument. All parts are perfectly interchangeable; that is, all dimensions are exactly to gauge and all parts are definitely and accurately located with respect to each other.

By using a special high-strength, high-resistivity alloy for the coil supports, and by giving them such a form as to offer high resistance to eddy currents, errors from this source have been practically eliminated. Tests up to 900 cycles per second and at low power-factors showed a total error of only 1 per cent.

The field coils are accurately centred by the internal flanges and are kept in alignment by fastening them firmly against the sides of the supports which are rolled to gauge for this purpose. The field coils are so designed that they will carry double full load current continuously and may even be subjected to three times full-load current without overheating. This enables the measurement of full power at very low power-factors.

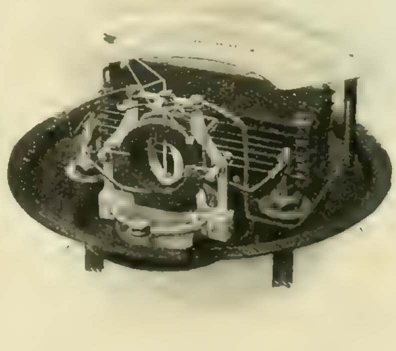
The movable systems of these wattmeters are claimed to be marvels of precise construction and in this respect to compare with the highest grade watches. The whole system weighs only 1.83 grams, including coil, pointer, springs, jewels is negligible, so that the life should be correspondingly long.

By suitably choosing the relative proportions and positions of the field coils and the movable coil every one of the wattmeters in this group has been given a uniform or proportional scale. This is a valuable achievement since it has been generally believed that a non- uniform scale was inherent to this type of instrument. A uniform scale is especially valuable in a switchboard instrument, since it enables the attendant to make approximate readings from a distance based on the position of the pointer with reference to the scale as a whole.

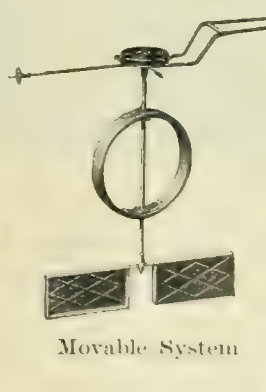
The new Weston alternating-current switchboard instruments are equipped with a new form of pointer, triangular in shape. By this construction the pointer has been given an extremely high natural frequency, which entirely removes it from the possibility of resonant vibration at any commercial frequency. This type of pointer is also extremely light and strong.

The damper used in these new Weston instruments is a new form of air damper. It consists of two symmetrically mounted vanes enclosed in fan-shaped chambers, cast in one piece with the base. The vanes are made of extremely light sheet alloy stiffened by ribs stamped into the metal and by the edges which are bent over. The chambers have tapered walls, which facilitate the rapid assembly of the delicate and accurately fitted vanes, and each chamber is closed by a tight-fitting cover, the only communication with the outside air being through a small arc-shaped opening which is just large enough to allow the free movement of the arm that carries the vane. The leakage of air to and from the outside through this opening is useless leakage and tends to prevent the compression and rarefaction of the air in the chamber by the motion of the vane and thereby impair the effectiveness of the damper. The leakage from one side of the vane to the other around the edges is useful leakage since it can be controlled by the designer to obtain any desired degree of damping simply by properly dimensioning the clearance space between the vane and the walls of the chamber. In the new Weston damper the useless leakage has been reduced to an unprecedented extent, by placing the vanes and chamber as near as possible to the axis of rotation. This arrangement has many other advantages: it is

Single-phase Watt Meter



Interior Single-phase Watt Meter



Movable System

Base and Needle Supports

self-balancing; it gives maximum damping with minimum staff and damper vanes. The friction and the wear at the weight of material and minimum moment of inertia.

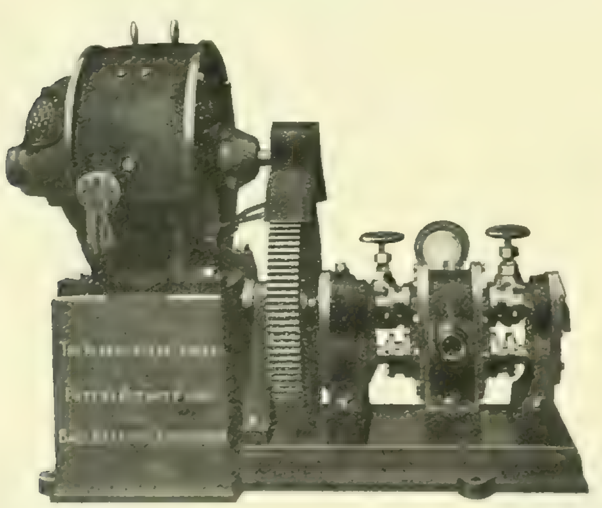
These new wattmeters are also equipped with a mechanism which permits the adjustment of the pointer from the outside. This device enables anyone to manipulate the spring abutment with a screwdriver from the front without breaking the seals or disturbing the connections. Furthermore, it is impossible to damage the instrument in any way by careless or wanton misuse of the device.

Polyphase wattmeters have the same general construction as the single-phase meters. The essential principle consists in mechanically coupling two single-phase wattmeter movements to the same staff.

The "Albany" Patent Water-Sealed Rotary Pump

A rotary pump has recently been placed on the Canadian market which is a radical departure from anything heretofore manufactured in the pump line. This pump has been designed with the object of producing the best results in pumps ranging from ½ to 6 inch in size, with a capacity of from 300 up to 60,000 gallons per hour. It is neither of the piston, centrifugal or semi-rotary type, but is constructed upon a new principle which practically combines all these systems and delivers a constant stream without the usual air chamber on the discharge. This pump is suitable for waterworks in small towns and is also very suitable for dealing with gas exhausters, oil, wine, vinegar, acids, spirits and general liquors in breweries and distilleries, creameries, hand and steam or gasoline fire engines, hot liquids, boiler soap, tar, fats and other liquids of high gravity. The impellers and casing can be supplied in metals to suit the liquor to be handled. This pump would prove valable to agriculturalists, florists, market gardeners as a spray pump or for water supplies.

The suction of the new type of Albany pump is greately increased, and it is now capable of lifting 28 feet and is good



for heads of 300 feet. An important feature in design is the arrangement for overcoming slip and leakage between the rotating impellers and the casing of the pump. A continuous water-packing forms a sealed watertight joint or cushion between the impellers and the casing. Recent tests of several of these pumps made at the School of Practical Science, Toronto, show that the efficiency ranges from 40 per cent. in the smaller to 80 per cent. in the larger sizes.

The Albany pump, we understand, is now being installed in all the new battleships and cruisers both by the English and French Admiralties. Canada's new cruiser "Niobe" has these pumps installed in her engine room. A large number of these pumps are already in use in all parts of the Dominion, and the manufacturers, for whom Mr. A. W. Bennet, of Toronto, is the Canadian distributor, advises us that they are giving the best of satisfaction.

"Rymco" High Speed Automatic Trolley Switch

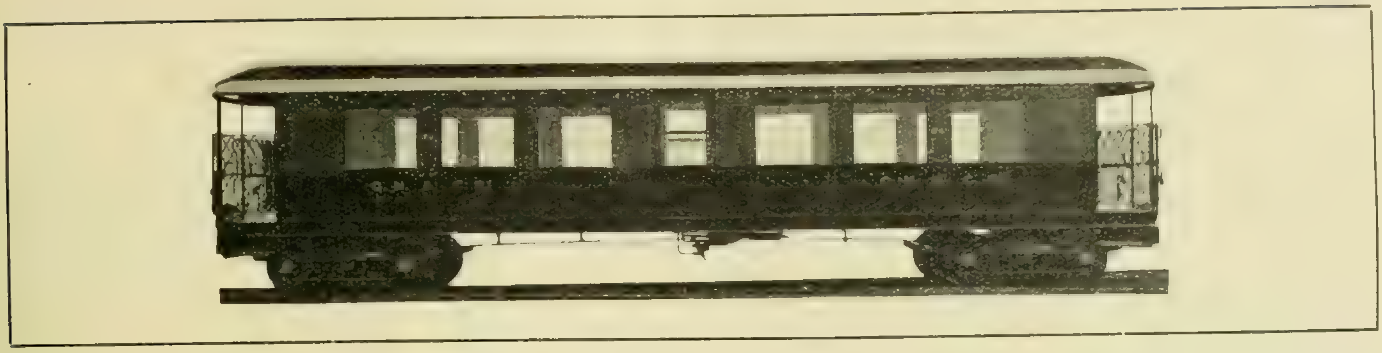
The "Rymco" high speed automatic trolley switch, illustration of which will be found in another part of this issue, and which is manufactured by the Railway Materials Company, Chicago and New York city, makes the claim of distinct departure from, and a decided improvement over the old methods of operative trolley construction at sidings. This trolley switch is designed to provide a continuous trolley at passing points, regardless of whether the siding or main track is used. By its use all delay caused by changing of trolley pole from the main siding wire is done away with, the throwing of the track switch lever accomplishing the proper adjustment of the tongue blade so that the relative position of the siding and main trolley wires is at all times exactly the same as the relative position of the main and siding track rails.

By referring to the illustration, the simplicity of the device can be readily appreciated, the most important feature being a metal tongue about 6 feet in length fastened at its rear end to the siding wire and when not in use, lying almost parallel to same. Bolted to the double hanger, directly over the track switch, is a metal hood which extends quite a little distance forward and effectually protects the wearing parts immediately underneath from snow and sleet storms or from other conditions which might tend to decrease its operating efficiency. A slotted opening is provided in the rear end of hood through which passes a forged bolt which is rivetted to the tongue blade. This bolt is in turn connected with a pull rod which, working in conjunction with a ½-in. pipe and bell cranks, establishes direct communication between the track switch and the blade tongue of trolley switch.

One great advantage to be found in the use of this type of automatic high speed trolley switch is that when siding is not being taken, the main line is left absolutely open and unobstructed by any casting whatever, the trolley wheel riding the main line without the slightest possibility of jumping. Many other important advantages are claimed for this device. Its use will cause a saving in excess trolley wire at every siding, and will insure efficiency in service as compared with older methods. It does away with the necessity of transferring the trolley wheel, an operation which not only represents an appreciable loss of time, but is conceded to be one of the possible causes of accidents at sidings, owing to the fact that the car is necessarily in absolute darkness during the transfer of the trolley wheel.

English Street Cars

The Canada Ford Company advises that among the orders for electric rolling stock recently executed, or now in the course of execution at the works of their principals, the Brush Electrical Engineering Company, Limited, of Loughborough, England, are the following—London County Council, 250 double-deck cars, and Metropolitan Electric Tramways, 55 similar cars. These two orders are for rolling stock which is now standardized in the London area, about 2,000 cars of this type being already in service. The Metropolitan Electric Tramways Company holds the franchise from the Middlesex Councy Council for a very large area lying immediately to the north of London County. Similar orders have been, or are being executed for the following English towns—Derby, Croydon, Wallasey, Barking, York,



Torquay, Southend, Accrington, Swansea, Grimsby, Musselburgh, Ilford.

For abroad important orders have been received from—Auckland, Bombay, Regina, and Johannesburg.

Steel Cars for Underground

The City & South London Railway was the first electric underground railway to be constructed in any part of the world. The tube is of much smaller diameter than any of those more recently built, and the cars are accordingly of smaller size. The latest additional rolling stock supplied by the Brush Company consists of steel cars of the following main dimensions—Length, 26 ft.; width, 6 ft. 10 in.; inside size, 6 ft. 8½ in.; seating capacity, 36; weight of car per seat, .224 tons. The whole of the framework is of steel. The floor is made of "Litosilo" fire-resisting cement laid on corrugated plate. The exterior of the car is moulded in teak, and the general appearance is made similar to that of cars previously constructed in teak throughout.

The Great Northern & City electric underground railway is somewhat different from the so-called tube railways, as it is constructed partly through open cuttings and otherwise through larger tunnels than those now standardized. This railway was one of the earliest in the world to adopt steel coaches. The example illustrated is 41 ft. 8 in. long, 9 ft. 4 in. wide, 8 ft. 5 in. inside height, accommodating 64 passengers.

The Ductor as a Detector of Very Small Resistances

The difficulty of locating small resistances in the return circuits of electric railway fender systems which resistances are generally the cause of the current seeking a more favorable return by water, gas or other pipes, resulting in electrolysis troubles, suggest the use under these circumstances of such an instrument as Evershed's Ductor.

The ductor is an instrument specially adapted for measuring low resistances. Following the megger and bridge-megger, it embodies the same practical advantages in the extreme rapidity and simplicity of testing, and the direct reading of the required value without calculation. What the megger and bridge-megger have done for the measurement of resistances from a few thousand megohms (megohm = a million ohms) down to one 1/100 of ohm, the ductor will do for resistances from a few ohms down to a few microhms (microhm = one millionth of an ohm). It covers the entire range of low resistance measurment, beginning at ten millionths of an ohm, and ending at 5 ohms, a value which is well within the range of an ordinary Wheatstone bridge. By means of a five-way switch, the whole range is divided into five grades, for which the scale readings must be multiplied by unity, ten, a hundred, a thousand and ten thousand respectively.

The scale is 110 mms. in length divided, by calibration, into 50 nearly equal parts, and the position of the index can be read quite easily to less than one quarter of a division. The reading can be noted within four or five seconds, and a complete test will not usually occupy more than one minute from start to finish. The readings are very nearly independent of the strength of the testing current, which may vary within wide limits without causing any appreciable error. Compensation is made for temperature and hence the scale reading gives the actual value which the test resistance has at the time the test is made, no matter what the temperature of instrument itself may be.

The ductor is intended to give the manufacturer all the information he needs about the resistance of the conducting parts of the things he makes, and give the plant user the same information as to the things he uses. A defective fuse, a bad contact, a faulty coupling or some other defective part

Evershed's Ductor for Small Resistances.

may fail, and the failure of one link in the chain may involve the breakdown of the whole system. Apart from defective insulation the first sign of impending failure in any part of a circuit is an abnormal change in its conductor resistance; it is the function of the ductor to detect the change long before the danger point is reached. For example, by the time a contact becomes overheated, breakdown is imminent; the ductor detects the gradual deterioration of a contact long before any abnormal rise of temperature is apparent.

Ironite Drop Cord

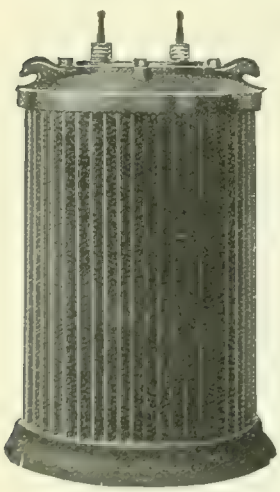
The Central Electric & School Supply Company, Toronto, announce that they have recently added the well-known Ironite drop wire to their stock of electrical supplies. Among the claims made for this wire are the following: It has ample conductivity; won't draw down or

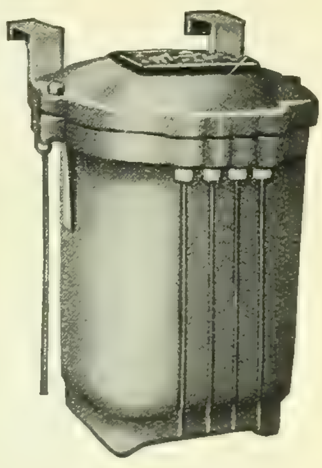
break because of heat or snap under the weight of snow and sleet, yet is stronger and lighter than copper; costs less than copper; lasts longer; very flexible; won't break when twisted or kinked; "stick-tight" insulation; never slips; braid is tight and thoroughly saturated.

The Canadian Moloney Electric Company

Fourteen years ago T. O. Moloney, at that time a young man with a definite idea and a limited capital, started into business in a modest way to manufacture transformers. He figured that the electrical lighting problem was one of vast possibilities and his idea was to make transformers better than the other fellow. As the acorn grew to the oak, so did his idea germinate and expand. The one man lathe of 1896 has been added to in the form of motor driven equipment, embracing foundry, pattern shop, winding, core cutting, assembling, finishing and testing departments, as well as laboratory in which the quality of Silicon steel for cores, the grade and conductivity of copper, the insulating micas, oil linen and tapes are at all times receiving the tests and careful scrutiny of experts.

The St. Louis factory with a floor space of 35,000 square feet, which has lately been working up to full capacity, produces every type of transformer on the market from the series and potential switchboard type to that of the wireless transformer and embraces power and lighting types .6 to 5,000 k.v.a., 440 to 100,000 volts, as well as series a.c. street





lighting transformer and regulator outfit, tungsten sign, testing and auto transformers of all sizes and description.

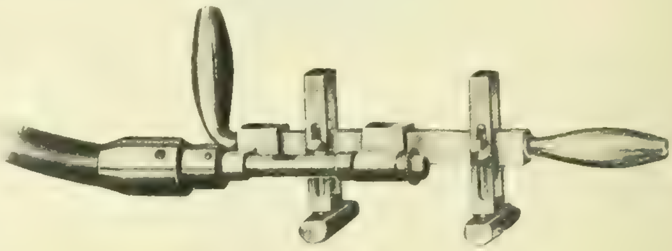
As a result of the rapidly increasing business and the realization that quick service in shipping was a factor, steps for the expansion of the production department of the business were considered, and in view of the development of power and lighting in Canada and the amount of business placed with the company for export in the past, the Canadian Moloney Electric Company, Limited, was incorporated, one and one-half acres purchased in Windsor and an excellent factory built with a floor space of 30,000 square feet and the best machinery and tool equipment possible.

The success of the Moloney Electric Company may be attributed not only to the efficiency of their transformer but also to the close personal supervision of Mr. T. O. Moloney, by whom the Canadian company will be personally and actively managed. Mr. J. J. Mullen, the efficient and close co-worker with Mr. Moloney during the life of the company, will remain in charge of the St. Louis factory.

The company is to be congratulated upon its success in business and the development of a product, the merit of which has contributed in no small measure to the efficiency of a.c. current distribution.

Commutator Slotting Tools

The slotting of commutators is now followed as a general practice by some of the large operating companies, particularly in railway work. In any motor where there is a tendency toward sparking, due to defective design, hard usage or the presence of dirt, the destructive action of the



spark causes the burning of the commutator segments at the trailing side. This reduces the level of the copper below that of the mica which, on account of its refractory nature, remains almost unaffected and holds the brushes off the copper, thus aggravating the trouble. The destructive action, once started, proceeds rapidly, precluding good motor operation.

Slotting out the mica to a depth of 1/32-in. or 1/16-in. below the surface of the copper makes possible proper contact of the brushes on the bars, and, in addition, permits the use of soft brushes, leading to longer life of commutator.

The Westinghouse Electric and Manufacturing Company, Pittsburg, manufacture two types of slotting tools for this purpose, one type air operated and the other motor operated. Each comprises a circular saw, with adjustable rests for centering the tool. Guides bearing on the commutator face are adjustable on the guide bar of the tool, making it applicable to a large range of commutator sizes. The guides also permit the depth of slotting to be accurately adjusted and maintained.

The motor operated slotting tool, shown herewith, is satisfactorily operated by a ¼ horse power motor running at approximately 1,700 revolutions per minute. A five-foot flexible shaft is provided for connecting the tool to the motor.

Vulcanization of Railroad Ties

From a railroadman's point of view, one of the most important items in the construction of a new roadbed is that of ties. Year by year, as the demand increases, the supply gradually decreases, and the cost advances in proportion to the enormous consumption. To put down a tie on a roadbed that would last a generation, would, a few years ago, have been considered an impossibility. But experiment and experience have now perfected a system whereby this can be accomplished. This is known as the Howard System of vulcanizing lumber. At the Toronto plant of the Lumber Vulcanizing Corporation of Canada, Limited, demonstrations have recently been made before prominent railroad men and lumbermen of the United States and Canada, whereby the ordinary railroad tie can be taken by them put through the Howard process and made practically to withstand all wear and tear of time. This firm states that on the Erie Railroad ties thus treated and laid in 1882 are to-day as fresh as newly-cut timber and hold the spikes well.

A New Winnipeg Factory

A new company to be known as the Reliance Electric Manufacturing Company, composed of western men, has

commenced operations at 259 Smith street, Winnipeg. The company are manufacturing a high grade dry cell and have engaged the services of a dry-cell expert high up in this class of work. Together with the manufacture of dry-cells, the new company is also manufacturing a full line of steel cabinets and boxes, together with panel boards, switches, and switchboards, of the most up-to-date designs. The have installed in their factory the very latest machinery and apparatus for the manufacture of these different lines, and are in a position to turn out a large quantity of work. They have a competent engineering staff, and are therefore in a position to handle the many different arrangements and designs of switchboards, etc., which may be presented to them. Mr. Charles T. Mitchell, the well-known electrical contractor, has recently severed his connection with the Mitchell-Gray Electric Company, and is the manager of the new company.

Large Montreal Order for Conduit.


Mr. B. S. Barnard

The Montreal L. H. & P. Company have just placed an order with Mr. B. S. Barnard, of New York, for upwards of 1,000,000 duct ft. of conduit as made by his company, the Clermont Sewer Pipe Company, Pennsylvania, U.S.A. Mr. Barnard was one of the original makers of conduit in the United States and has been interested and identified with several of the leading clay companies, and on January 1st was taken in with the Clermont Sewer Pipe Company, of Clermont, Penn., occupying the position of vice-president and manager of sales, in charge of their New York office. Mr. Barnard has supplied the Bell Telephone Company of Canada continually for twelve years, and for the best part of this period he has supplied the Montreal Light, Heat & Power Company, the Westmount Corporation, the Cataract Power Company, of Hamilton, Niagara Falls Power Company, and the Toronto Electric Light Company. Later advices state that the Bell Telephone Company has just placed its 1911 conduit order, amounting to 1,115,000 feet, with this same company.

The Blackburn Ground Clamp

The accompanying cut represents the Blackburn Ground Clamp for lighting and power circuits, which is manufactured by the Blackburn Specialty Company, of Cleveland, Ohio. This clamp is adjustable, has a removable copper lug, can be attached quickly, is simple and economical and is approved by the Underwriters.

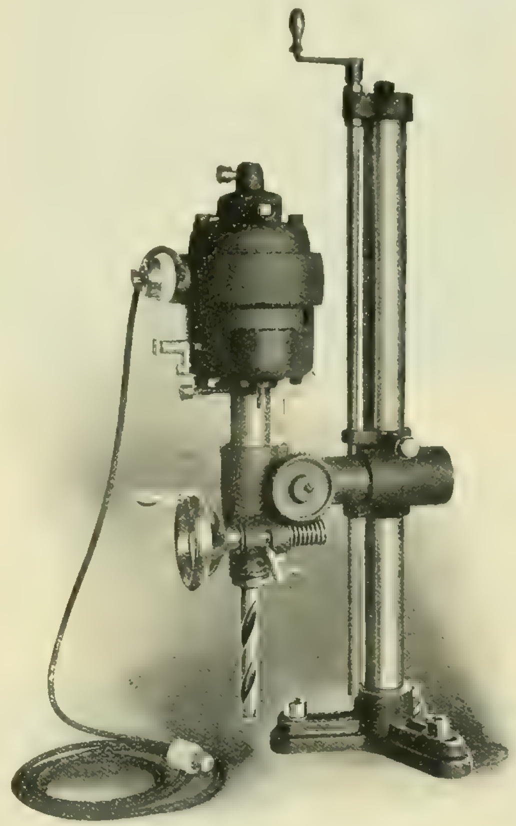
The lug is drilled for a No. 4 ground wire, and is tinned ready for soldering, while the flat end with boss is milled to give a clean smooth contact service on which to clamp the band.

Large Contracts Closed

The Winnipeg Office of the Eugene J. Phillips Electrical Works, Limited, through its western manager, Mr. W. H. Reynolds, announces the closing of the following contracts: with Saskatoon, for one-half of their year's requirements; with the Alberta government more than one-third, with Manitoba a small portion, and with Saskatchewan almost one-half of the year's requirements.

Electrically Operated Portable Drill

The cut shown represents an electrically operated radial drill recently placed on the market by the Lamb Electric Company of Grand Rapids, Mich. The motor is designed for operation at either 110 or 220 volts d.c. or a.c., 60 cycles. The specifications follow—capacity in steel, 1 inch and smaller, operated in any position, extreme height 40 inches, greatest height from spindle to base 28 inches, distance from column to centre of spindle 8¼ inches, column is 2½ inches



diameter, made of steel tubing, hole in spindle No. 3 Morse taper, travel of spindle 5 inches, operated by rack and pinion which in turn is operated by a worm and gear, two speeds furnished.

Winnipeg Office of Dongan Manufacturing Company

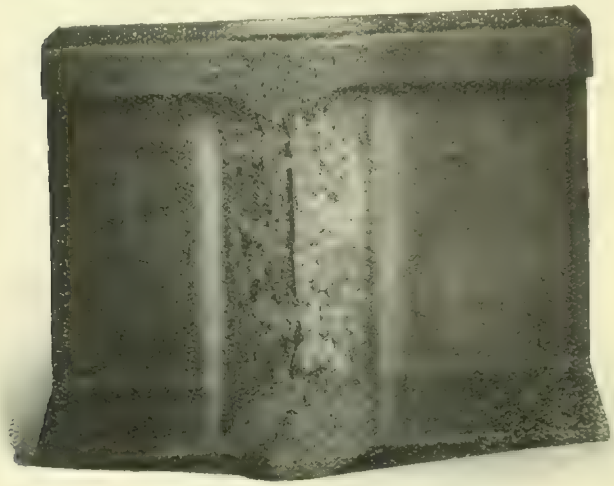
The Dongan Electric Manufacturing Company, manufacturers of electrical measuring instruments, announce the opening of an agency with the Tri-Provential Electrical Supply Company, of Winnipeg, Manitoba; Mr. J. Suttie, manager. Their line consists of switchboard and portable ammeters and voltmeters of the electro-magnetic and D'Arsonval type suitable for both large and small installations. At present their main office and factory are located at Albany, N.Y. After May first the plant will be transferred to 15-17 E. Woodbridge Street, Detroit, Mich.

Escher-Wyss Open Canadian Office

Escher-Wyss & Company, Zurich, Switzerland, announce that owing to the increased development of their water turbine business in Canada, they have decided to establish an office in the Lumsden Building, Toronto, of which their chief engineer, Mr. Heyerdahl, will be in charge. The canadian office is authorized to submit tenders, and all enquiries addressed thereto will receive careful and immediate attention.

Rail Joints by Termit Process

The cut shown herewith indicates a rail joint made according to the Thermit process of welding, as perfected by the Goldschmidt Thermit Company, of New York. The process consists briefly in surrounding the ends to be welded together with a brass mould into which very hot thermit steel is poured. The molten steel melts the ends of the rails and amalgamates with them so as to form a single homo-



geneous mass when cooled. The jointing of fractures up to 12 inches in diameter is frequently accomplished with quite satisfactory results. This process has been used successfully in welding crank shafts of great size, trolley rails as shown, broken wheels, broken bearings, etc. Thermit steel is also frequently used with great saving of time in the making of castings.

Water Turbine Plant at Wangen, Switzerland

The Escher Wyss & Company have just issued a booklet dealing with a description of their water turbine plant at the Hydro-electric power station at Wangen on the Aare river, Switzerland. This pamphlet is issued from the Canadian office, Lumsden Building, Toronto. The development is a low head 9,000 h.p. plant. The turbines are the four runner multiple type of which six will be installed. The head will vary between 24 and 30 feet. The pamphlet is well illustrated, showing construction views of the power house and cross sections of the constructed plant.

Colored Lights for Coronation Festivities

A pamphlet has just been issued by Griffiths Bros. & Company, London, through their Canadian agents, Solomon & Spielmann, 22 St. John street, Montreal. This pamphlet describes a preparation for coloring electric lamps, called "Shadolite." It is very durable, and easily applied, but can be removed by methylated spirits or alcohol. In view of the approaching Coronation festivities Shadolite will be found very effective for lamp decoration. It is claimed by the manufacturers that glass stained by this preparation can only be distinguished with difficulty from glass stained in manufacture.

Cedar Rapids Development

There is apparently much difference of opinion as yet as to the exact amount of power capable of being developed at Cedar Rapids, the water power recently purchased by Mr. D. Lorne McGibbon, of Montreal. Mr. McGibbon's plans are not yet matured, but he states that there is 150,000 h.p. at this point which he intends to develop as quickly as possible. It is reported that Mr. McGibbon is acting in conjunction with the interests which control the Canadian Light & Power Company, which in turn are closely connected with the Montreal Street Railway, but the exact relation between these forces has not yet been made clear.

Trade Publications

J. M. Linolyte System of Lighting—booklet by the H. W. Johns-Manville Company, New York, describing and illustrating their linolite carbon and tungsten lamps.

Bell Motors—Bulletin 132 by the Bell Electric Motor Company, of Garwood, New Jersey, describing the Bell Automatic single-phase repulsion induction motors.

Insulating Varnishes—A booklet issued by the Griffiths Bros. & Company, through their Canadian agents, Solomon & Spielmann, 22 St. John street, Montreal, descriptive of insulating varnishes, enamels, paints, etc.

Factory Lighting—A booklet issued by the Nernst Lamp Company, Pittsburg, by their Toronto office. The illumination of numerous factories by these lamps is described and illustrated and much general information on proper illumination of large buildings is given.

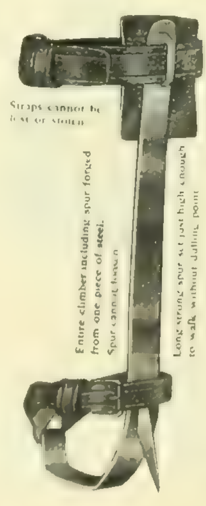
Protected Rail Bonds and Tools—Catalogue No. 4, issued by the Electric Service Supplies Company in three volumes. (1) Electric Railway Overhead Line and Track Supplies; (2) Electric Car Equipment and Supplies; (3) Electric Supplies for Mine and Industrial Haulage.

Garton-Daniels Lightning Arresters—1911 catalogue issued by the Electric Service Supplies Company, Chicago, descriptive of their various types of lightning arresters. These arresters with their connections are described very fully and much valuable information of a general kind is contained throughout the booklet.

Manual for Engineers. The Sangamo Electric Company, Springfield, Illinois, have issued a Pocket Data Book which contains a great deal of valuable engineering information for mechanical and electrical engineers. The reference tables are conveniently arranged and the manual should prove of much value to the recipients.

Electric Supplies—general catalogue number 3, issued by the Central Electric & School Supply Company, 36 Adelaide street west, Toronto. An unusually complete catalogue of electrical supplies, covering 400 pages of well illustrated matter, bound in stiff covers. This is one of the most comprehensive and useful catalogues we have seen distributed.

Roberts' Patent Climber



The accompanying cut shows a new pole climber manufactured by the Oshkosh Tool Company, Oshkosh, Wis. The entire climber, including the spur, is forged by a special process from one piece of crucible tool steel. The spur is set just right for easy climbing or comfortable walking. It is possible to walk over rough ground or gravel without dulling the point or on a tin roof without piercing the tin. The spur is so shaped and tempered as to quickly get a solid hold on the pole and still be pulled out easily. The straps fit smoothly around the foot. A little ring does it. This climber is not only comfortable but the straps will last twice as long because there is no fold or friction.

BRUSH ELECTRIC ROLLING STOCK

Trailer Car for Metropolitan District Railway, London

All Steel Trailer Car for City & South London Railway

Brush Car and Truck for Shanghai Tramways Co.

All Steel Trailer Car for Great Northern & Piccadilly Railway, London

Current News and Notes

Aberdeen, Sask.
The town telephone system will be completed in a few days, and in connection with the two rural lines already working and three others to be installed this summer, will give Aberdeen and district a complete system

Bayfield, Ont.
The Ontario West Shore Railway Company is in negotiation with the council of Bayfield in connection with the proposed extension of the railway south from Goderich to this place.

Berlin, Ont.
A portion of the Galt, Preston and Hespeler Railway is now being operated by Niagara power supplied from the municipal sub-station here.

Bowmanville, Ont.
The by-law authorizing the sale of the town's electric light plant and franchise to the Seymour Light & Power Company for $16,000, carried by a good majority. A second by-law to grant a fixed assessment of $5,000 to the Seymour Light & Power Company for ten years was defeated.

Brandon, Man.
A by-law will be submitted to the ratepayers asking authority to spend $300,000 in the construction of a municipal street railway system.

It is not expected that the proposed street railway can be ready for operation inside of eighteen months.

Brockville, Ont.
Eastern Ontario municipalities from Napanee to Morrisburg have already subscribed for 8,125 horse power on the terms announced by Hon. Adam Beck, chairman of the Ontario Hydro-electric Commission. It is proposed to develop the power at Waddington, N.Y. A transmission line from that place to Ogdensburg may be built this summer.

The light commissioners are contemplating a radical reform to have the service wires for the electric light enter from the rear of buildings instead of from the front. This will permit the removal of wires and eventually the poles, from the streets. Manager Wilkinson is now inspecting the ground with a view of making a start in the change, which will probably begin in the business section.

Calgary, Alta.
The new steam plant in Victoria Park capable of developing about 900 h.p. is now in operation. For the present it will be used to carry the street car load.

City Solicitor Moffat has been instructed to notify the Calgary Power Company that the city is ready to take the power from the hydro-electric plant at Horseshoe Falls.

Tenders for the city's supply of wire for the coming season has been awarded to the Canada General Electric and General Supplies, Limited. Their tenders were the same: For No. 8 to 4-0, $17.20 per hundred, and for 5 to 10, $18.20

Power and light rates will be very materially reduced when hydro-electric energy reaches the city. Lighting rates will be reduced from 11 to 9 cents per kw.h., with the usual 10 per cent. discount. Power rates will be as follows: up to 750 kw.h., 2c.; 751 up to 1,750 kw.h., 1 8-10c.; 1,751 up to 3,500, 1 6-10c.; 3,501 up to 12,500, 1 3-10c.; 12,501 up to 25,000, 1 1-10c. Ten per cent. discount on all rates.

Contract for equipment for the electrical plant at Victoria Park were recommended as follows: a 1600 k.w. turbo-generator set from the Allis-Chalmers-Bullock Company, $41,965. This is to be installed and in operation by August 22 next under a bond of $5,000; The Belliss-Morcom Company tendered for a 1500 k.w. generator, but could not deliver it before ten months. Gorman, Clancey & Grindley's tender for a 2-ton crane at a cost of $3,190. The Canadian Westinghouse Company for a 100 k.w. exciter for $4,300, the lowest; the Allis-Chalmers-Bullock Company will have charge of removing and re-erecting the old boilers from the power house in the west end to Victoria park, and such necessary work as is required, at a cost of $36,790.

Cranbrook, B.C.
The Cranbrook Electric Light and Power Company now have considerable power for sale for industrial purposes, there being available upwards of 600 horse power.

Dartmouth, N.S.
A company is seeking incorporation with a view to building an electric railway in Dartmouth out to Cow Bay. A. C. Pyke is interested. Robert Stanford, owner of Cow Bay Beach, is one of the incorporators.

A bill has been introduced in the local legislature to incorporate the Dartmouth & Cow Beach Electric Railway Company for the purpose of constructing and operating an electric railway in this town. The company also asks to be allowed to sell power.

Edmonton, Alta.
The city council has finally decided upon terms of agreement with the International Heating & Lighting Company, of Cleveland, for a franchise to manufacture and distribute artificial gas, and a by-law will be submitted to the ratepayers next month. The franchise is for 25 years, the city retaining the right to purchase by the end of that time and every five years thereafter. The initial price fixed by the agreement is $1.65. The company guarantees to supply gas within 18 months. Their investment in the city will be over half a million dollars. Edmonton at the present time is the largest city on the continent which is without a gas supply.

Fernie, B.C.
Latest information is to the effect that the Bull River Power Company are disposing of their interests to an English syndicate which is reported to be arranging to acquire Elko power also

Fort William, Ont.
At a recent joint meeting of the street railway boards of Port Arthur and this city, the question of establishing a municipal car factory was discussed. Failing this an attempt will be made to interest private capital.

The commissioners of the joint street railway board seem to be in favor of having the car works established here. Commissioner Fortune submitted a report on the plant which he proposed should be built by the city.

W. L. Bird, manager and secretary of the Kaministwkia Power Company Limited, writes that contracts in connection with the extension of power plant at Kakabeka Falls have been awarded as follows: John Inglis, Toronto, penstocks; waterwheels, J. M. Voith, gen- Canada General Electric, electrical equipment; Steel Company of Canada, copper wire. Estimated cost, $200,000.

Fredericton, N.B.
A bill has been introduced in the local house incorporating the St. John River Electric Power Company. It is the intention of the company to develop a water power on the St. John River, near the mouth of Pokiok stream and transmit to St. John (100 miles), Fredericton (30 miles), and other neighboring towns.

The 24-hour service inaugurated some months ago by the Gas Light Company is reported as not paying expenses during the daylight hours. An attempt is being made to materially increase the day load by having manufacturers and others install power apparatus of different kinds. Failing this the day service will be discontinued.

Hull, Que.
City Engineer Chene is preparing estimates of the cost of erection of a number of lamps similar to those in use in Ottawa for lighting the streets.

It is understood that the extension of the Hull Electric Railway to Chelsea will be proceeded with this year. Preparatory to this the Hull Electric Company are building car sheds at Hull Junction which will cost about $25,000.

Ingersoll, Ont.
This town will install 250 100-watt tungsten lamps for street lighting.

Lethbridge, Alta.
It is proposed to commence operations on a street railway system which will require the supply of new boilers, alternating - current generating unit, about 1,500 k.v.a. capacity, and a rotary converter set. Arthur Reid, superintendent.

The city's electric light and power plant was operated during the year 1910 at a net profit of $30,864.52. The total receipts of the plant for the year were $86,221.30 and the expenditures, including debentures, interest and sinking fund apportionments, $35,356.

London, Ont.
The water commissioners may join with the city in having an electrical inspector named for the city of London.

It will be necessary to purchase two new transformers for the Niagara

power station on Horton street. Superintendent Glaubitz.

The Hydro-electric engineers are wiring houses for which payment is to be made on the instalment plan. This would appear to be the most ingenious use, to-date, of the pay-as-you-please system.

At a recent meeting of the city council Ald. Wilson gave notice that at the next meeting of the council he would move that the provisions of By-law No. 916, relating to the London Street Railway Company, be enforced. Ald. Wilson claims that the service is not up to standard.

The London Street Railway Company are installing new headlights on their cars to conform with the agreement made with the board of works some time ago. The new lights are directly under the vestibule windows, and are of greater candle-power than the old lights that were placed on top of the car.

Judgment has been given by the Ontario Railway and Municipal Board on the application of Wm. Kerley, of St. Thomas, to sue the London and Lake Erie Railway and Transportation Company for operating cars on Sundays. The application is granted, and the Sunday car case will be tested in the courts.

The transfer of the London Street Railway System, the London Electric Light plant and the London & Lake Erie Railroad to interests very closely associated with Mackenzie & Mann is a reasonable possibility of the near future. It is quite possible too, that the same group will take over the franchises now held by the People's Railway Company.

Montreal, Que.

The water power known as Cedar Rapids, situate on the St. Lawrence River 27 miles downstream from Montreal, has been purchased by interests associated with Mr. D. Lorne McGibbon. In the neighborhood of 15,000 h.p. may be developed here.

Interests opposed to the damming of the Long Sault Rapids have decided that if the navigation of the St. Lawrence is to be preserved energetic measures must immediately be taken to fight the project at Washington, and arrangements have been made to prepare for a lengthy campaign against the proposal. The announcement is made that Hon. Clifford Sifton, chairman of the Canadian Conservation Commission, is prepared to subscribe a sum equal to that contributed by any individual or corporation in this city or elsewhere. Some of these amounts will in all probability be large. Although the scheme received a setback at the hands of the last United States Congress, there is now no doubt that another bill will be brought up at the present extra session at Washington and another determined effort made to railroad the measure through at the American capital.

Moose Jaw, Sask.

The contract for the building of the power house and car sheds for the Moose Jaw Electric Railway has been awarded to Navin Bros., of this city.

It is definitely announced that a partial street car service will be operated here in about four weeks, using city power until the company's power house is erected. The rails were laid last year, and cars are en route.

Nelson, B.C.

The Nelson Street Railway Company are asking the citizens to subscribe for another $10,000 worth of stock for extensions.

New Westminster, B.C.

After thirteen years' service with the British Columbia Electric Railway Company, Mr. D. J. Stewart, local manager for the company at New Westminster, has retired from the service.

Oak Bluff, Man.

A large and representative meeting of ratepayers of Macdonald municipality having met to discuss the feasibility of a street car service for the municipality appointed a deputation consisting of over thirty landowners and ratepayers to interview the council at its next meeting and ask for its support in approaching the proper parties for the proposed service.

Ottawa, Ont.

The street railway will be extended from High street to Algonquin street on Red River Road, 4,000 feet, as soon as material is received.

The Railway Commissioners have been considering an application from the Bell Telephone Company that they be allowed to raise their rates between Sarnia and Detroit.

A citizen of this city commenting on an incident which recently occurred on the Ottawa Electric Railway system gives it as his opinion "that Ottawa is particularly fortunate in having such careful motormen and courteous conductors on her street cars."

One of the handsomest electric cars ever seen on the streets of Ottawa was tried out here recently. The car, which was one of six ordered for the Moose Jaw Electric Railway Company from the Ottawa Car Company, will be shipped to its western home in about two weeks.

One of the resolutions passed at a recent meeting of the allied trades and labor council read, "To extend the franchise of the street railway company would be unwise, but if satisfactory terms can be made for the city to purchase the system, it is a duty to regain possession of our streets and to cheapen the means of transportation."

The street railway extension committee will recommend to council that the street railway line be extended to the cemeteries by St. Patrick street. By having a single track no bridges would need widening and the grading, etc., would cost about $14,500, while to go by Montreal road, two bridges would be necessary, which would cost about $70,000.

A large meeting of those interested in the Ottawa, Smith's Falls and Kingston Electric Railroad was held recently. Messrs. F. A. Heney, of Westboro; W. Kidd, of Burritt's Falls; J. F. Caldwell, of City View; G. I. Dickinson, of Manotick, and Geo. Boyce, of Merrivale, were appointed provisional directors to canvas the country, call meetings and raise funds for the construction of the railroad.

Twenty new pay-as-you-enter cars will be put on the Britannia line this spring. These cars are larger than the Bank street cars, accommodating forty-four people. The interior will be finished in cherry wood, with electric heaters under each seat, with two folding doors on the rear vestibule, together with a seat for the conductor. The sationary cabinet fare box will be used on these cars.

After negotiations extending over a period of some weeks, the committee of the Commercial Telegraphers' Union, representing the telegraph operators employed by the G. N. W. Company, has been advised by the Department of Labor that its request for a board of conciliation and investigation has been granted. Mr. David Campbell, Toronto, has been appointed to represent the men's interests on the board.

Port Arthur, Ont.

Secretary Wilson estimates that the increased revenue of the street railway due to the establishment of the pay-as-you-enter system amounts to about 5 per cent.

Prince Albert.

The price of electric light has been reduced from 10½ to 9½ cents per kw.h.

Prince Rupert, B.C.

The city council are considering the best means of increasing their supply of electrical energy. A water development is being discussed.

Port Moody, B.C.

The town is now electrically lighted by the British Columbia Electric Railway Company.

Quebec, Que.

Orders have been placed for fifty freight cars of the Gondola type, 60,000 lbs. capacity, by the Quebec Railway, Light, Heat & Power Company.

We are informed that the Quebec Railway, Light, Heat & Power Company, Limited, have awarded contract for construction of the double-track electric railway from Beauport Station to Montmorency Falls Park at Kent House, a distance of 3.3 miles. The railway will be rock-ballasting throughout, all 80-lb. A. S. C. E. steel rails, and the work is to be completed by June 20th. J. G. Brill Company, Philadelphia Car-builders, have supplied ten open single-truck car bodies for the Quebec County Railway. C. E. A. Carr, general manager.

Regina, Sask.

Different schemes of street lighting are being discussed thoroughly before any decision is reached.

The by-law granting the city council the sum of $50,000 for the completion of power plant was approved by the ratepayers. The city will now be in a position to treat with the C. P. R. in the matter of furnishing power to shops.

Tenders addressed to S. P. Porter, deputy minister railways, telegraphs and telephones, will be received until April 22nd for construction of the following lines: Moose Jaw, Swift Current, Abernethy-Strassburg, Saskatoon-Battleford, Wolseley-Windthorst, Saskatoon-Biggar.

Revelstoke, B.C.

It is understood a franchise for a street railway system has been promised a newly organized group of financiers here called the Dominion Securities Company.

Ripley, Ont.

Tenders addressed to Angus Martyn, sec.-treas., will be received until May 11th for construction of a telephone system in the Tp. of Huron. Plans, etc., at office of the above.

Ruskin, B.C.

It is expected that the Western Canada Power Company will be ready to deliver 25,000 horse power in New Westminster, Vancouver and the surrounding district by the 1st of July.

Sandwich, Ont.

Robert Stuart, of Detroit, has been given a fifteen-year franchise to construct and maintain a transmission line in Sandwich to connect with Essex, Kingsville, Harrow and Leamington, for the purpose of operating an electric power plant here. Operations on the plant will begin at once and the work of setting the poles will be started as soon as a right-of-way can be secured from property owners. The plant will be erected on the old Lagoon Park property.

Saskville, N.B.

Local men with backing, it is reported, are about to become owners of the N. B. and P. E. I. Railway, running from here to the Straits of Northumberland, and will put on electric cars.

Saskatoon, Sask.

A. G. Sangster, electrician and municipal engineer of Vancouver, has been appointed as electrical superintendent of Saskatoon. It is expected that this year will see a doubling of the power demand.

Out of six propositions for the building and the operation of a street railway system in Saskatoon, the special committee appointed to consider offers presented a report recommending that the proposition of a syndicate represented by Major J. F. Hutcheson, of Ottawa, be accepted. There was considerable opposition to a hasty adoption of the report, and, after much discussion, the matter was left over for a later decision.

It has been decided that the city engineer should secure complete information as to the cost of installing, operating and maintaining a street railway in Saskatoon as a municipal enterprise. The information to be considered in conjunction with the other street railway propositions. Prof. Greig will also prepare a report on the relative methods of producing power for the city's use.

Selkirk, Man.

The claim of the Selkirk Light & Power Company to a perpetual franchise in this town has finally been dropped by the company. It is very likely the W. S. & L. W. Railway Company, a subsidiary of the Winnipeg Street Railway Company, will be given a franchise to supply both light and power.

A deputation from Selkirk town council waited upon Manager Phillips, of the Winnipeg Street Railway Company, to formally request an offer from the company to supply Selkirk with electric light and power. Mayor Ross has stated that at first Selkirk would require about 500 horse power and that they would like prices on a block of power which they would distribute themselves or would consider a proposition from Winnipeg to deal direct with power users of Selkirk in addition to supplying the corporation with needed power and electric light for the streets.

Sherbrooke, Que.

The Canadian Westinghouse Company, of Hamilton, has the contract to install the civic lighting plant here. The contract is worth about $40,000.

Strathcona, Alta.

The Burnham-Frith Electric Company, of Edmonton, will open a branch store in this city, having engaged the office one door west of J .G. Tipton & Son, Whyte avenue.

Smith's Falls, Ont.

The route map of the Ottawa, Smith's Falls and Kingston Electric Railway was submitted a few days ago to the township of Montague for approval of the people of that section. The map shows the line running on the north side of the Rideau river up from Ottawa, through Manotick, Kars, North Rideau, Merrickville, Kilmarnock, to Smith's Falls. From here a branch line is projected to Lanark village, through Perth.

Sturgeon Falls, Ont.

The report on the supplying of electric power and lighting and water, estimates the outlay for such at $50,000. The money is not on hand for such an expenditure and the council are considering the advisability of arranging with some company to erect a pumping station, the council to have the option of purchase when practicable.

St. Boniface, Man.

A club has been organized here of men connected with electrical work both in St. Boniface and Winnipeg. City Electrician Swain, of St. Boniface, was appointed chairman, and Mr. Mitchell, of the Mitchell Electrical Company, secretary of the meeting. The following officers were elected: Honorary presidents, Mayor Evans and Mayor Bleau, Aldermen Cusson and Lachance of St. Boniface, and Controllers Waugh and Cockburn of Winnipeg; president, Fred A. Cambridge; vice-president, Mr. Swain; secretary-treasurer, Mr. Schumacher; executive committee, Mr. McKittrick, Mr. McKenzie, Mr. Douglas and Mr. Langley.

St. John, N.B.

A Greek confectioner, found guilty of stealing current from the Street Railway Company by short circuiting his meter has been sentenced to pay a $1,000 fine and spend two years in jail.

St. Thomas, Ont.

Niagara power was turned on by the Hon. Adam Beck on March 26. This city is the most remote point in Ontario receiving Niagara power.

Mason H. Baker, city engineer, has made a report on street railway conditions in which he estimates the cost of placing the system on a proper footing at about $65,000. This includes the purchase of five new cars.

The following are the estimates of the cost of proposed street railway improvements as compiled by City Engineer, Mason H. Baker: Overhauling Belt line, $18,970; overhauling Wilson avenue line, $3,400; overhauling G. T. R. Station line, $1,750; repairing present cars, $2,500; three new cars, $9,000; total, $34,620.

St. Vital, Man.

Work will begin this spring on the municipal electric railway here.

Truro, N.S.

The Board of Commissioners of Public Utilities have given notice that on April 25 a public hearing will be given the complaints against the Chambers Electric Light & Power Company of this place. The hearing takes place in Truro.

Thessalon, Ont.

It is reported that this municipality will instal an electric light plant and power house.

Toronto, Ont.

The Ontario Railway and Municipal Board have approved of the construction of loop on Louisa street.

This city will celebrate the arrival of Niagara power by a banquet and reception in the City Hall on May 2.

The city council will receive tenders for the construction of a system of tubes running north and south from St. Clair avenue to Front street.

The city of Toronto has filed, for the approval of the Ontario Railway Board, its plans, profiles, and books of reference for the proposed street railway lines on St. Clair avenue from Yonge street to the G. T. R. tracks, and on Gerrard street and Coxwell avenue, from Greenwood avenue to Main street.

The City Engineer has asked authorization to purchase meters for the electrical department in the open market, at a probable cost of $7,500. Tenders were called for the supply of electric meters, but those received were so unsatisfactory to the department that the engineers recommended their rejection.

Controller Hocken's special committee on street railway matters recommends to council the construction of a subway from the Union Station to St. Clair avenue for the use of radial lines, the city engineer to be instructed to prepare plans at a cost of $5,000. When the plans are ready tenders are to be asked for. If a tender is satisfactory to the city council, the question must go to the people on January 1st next before the contract can be awarded.

Application has been made to the Ontario Railway and Municipal Board by the Toronto and York Radial Railway Company for approval of plans and profile of a proposed deviation of the south end of the Metropolitan division, westerly off Yonge street from the C. P. R. tracks northerly to within a few feet of Balmoral avenue. This application means that it is the intention of the railway to entirely remove the tracks from Yonge street for that distance.

At the annual meeting of the Toronto Electric Light Company an offer to purchase the assets of the company on a basis of $135 per share for the $4,000,000 of outstanding stock was accepted by a majority of the shareholders. By this transfer the three interdependent interests, the Toronto Power Company (including the developing and transmitting companies), the Toronto Railway Company and the Toronto Electric Light Company, all come under the control of the same interests.

Because two clauses of the agreement made between the Bell Telephone

Company and the Township of St. Vincent local municipal telephone company practically prevent the local company from connecting its system with the system of any company, person or persons operating in opposition to the Bell Telephone Company, the Ontario Railway and Municipal Board has refused to approve of the agreement, and has so notified both companies. The agreement forbids the local company to transmit or permit transmission of messages from any telephone system with which it at present connects, or with which it may in future connect with points on the system of the Bell Company.

Vancouver, B.C.

The Western Canada Power Company is asking an extension of time to commence delivery of power in this city to January 1st, 1912.

Premier McBride has definitely declined to undertake the work of installing a provincial system of rural telephones.

It is said the Call Automatic Switch Company, of Denver, Colorado, have decided to organize a Canadian company in Vancouver, to manufacture railroad switches and particularly the Call Automatic Switch.

The project of establishing an all-Canadian telephone line of communication between the Kootenays and the Boundary country and on to the coast is now being brought to the attention of the boards of trade of British Columbia.

Messrs. Chapman & Walker, Limited, a firm of electrical and engineering contractors of Toronto, have just organized a branch for British Columbia, and have opened offices and warerooms in the Imperial block which have been placed under the management of Mr. S. H. Excell.

City Electrician McCrossan has suggested that an auxiliary system be arranged in connection with the fire alarm and police patrol systems, private firms being allowed to connect with the city's wires on payment of a monthly rental for the service. The rate suggested is a minimum of $5 per month for the fire alarm connection and $10 for the police patrol system. It is stated that in Seattle, where the auxiliary system has been operated for several years, the receipts from this source were $13,000 last year.

There has been a forty-five per cent. increase in the tramway traffic for the first three months of the year as compared with January, February and March of last year. The figures demonstrate an increased population in Victoria and the growth of the residential districts. The comparative statement for the three months a year ago are as follows:

	1911	1910
January	546,092	415,150
February	522,990	359,325
March	584,250	365,437
Total	1,653,332	1,139,912

Vernon, B.C.

The Mayor has suggested the plan of building a partnership power plant with one or two other towns in this neighborhood. Shuswap Falls would be the probable point of development.

Victoria, B.C.

The city council has decided to make the following purchases of appartus and plant: Thirty-five thousand feet of 3-inch fibre conduit, at $7.50 per 100 feet; 50,000 feet of 1-inch galvanized steel conduit, at $8.40 per 100 feet. Tenders will be called for a supply of 150 cedar poles; 8,000 pounds of copper line wire; 1,000 pounds of flexible arc cable; 1,000 glass insulators; 150 magnetic arc lamps and cut outs; 4.50 light transformers, and 1-20 circuit arc switchboard.

Windsor, Ont.

The city council has received a proposition from the local Street Railway Company offering to supply electrical energy from its new power plant in connection with the plant of the Canadian Salt Company at a rate estimated by the company to be equivalent to $35 per horse power per year.

Winnipeg, Man.

The corporation of the city of Portage la Prairie is negotiating with Winnipeg for the purchase of a block of power from the new power plant at Point du Bois.

Condensed Department

RATES

Positions Wanted, Positions Vacant, Miscellaneous. } 2 cents a word and 25 cents for a heading, per insertion

Tender advertisements, equipment for sale, etc., 15 cents per agate line (14 agate lines make one inch) per insertion.

Advertisers who wish to conceal their identity may do so by using an Electrical News box number without extra charge.

Forms close on the 18th of each month

City of Wetaskiwin, Alberta

WANTED—A second engineer capable of handling steam and gas power in Electric Light and Power Plant of 400 h.p. capacity. State age, qualifications, salary expected and send references. Applications to be in by May 15th, 1911.

E. ROBERTS, Sec.-Treas.,
5-5 Wetaskiwin, Alberta.

Tenders for Electrical Machinery

Sealed tenders addressed to the City Commissioners, and marked "Tenders for Electrical Machinery," will be received until **Wednesday, May 31st, 1911**, for the following:

A. One 100 h.p. Cross Compound Engine with necessary condensing apparatus, steam piping, installed complete.

Tenders on Engines of the following classes as follows will be considered:—

(1) Horizontal Cross Compound Corliss Engine, 125 150 r.p.m.

(2) Vertical Cross Compound Corliss Engine, 125 150 r.p.m.

(3) Vertical Cross Compound Quick Revolution Forced Lubrication

B. 600 kw., 2,200 volt, 60 cycles, 3 phase Engine Type Alternator, Exciter, Switchboards, Automatic Regulator, installed complete

C.—72 in. x 18 ft. Return Tubular Boiler, suitable for 150 lbs working steam pressure.

Specifications will be furnished on application to the City Commissioners, or R. Wright, City Electrician.

The lowest or any tender not necessarily accepted.

ANDREW HOLMES,
C. O. DAVIDSON, City Commissioners
F. A. CREIGHTON, 5-5

Ste. Marie, Ont.

WANTED

a large and well equipped factory. Will make under contract or on royalty metal specialties, electrical device preferred. Will buy outright any patent article of merit.

For further information address Box 248, Electrical News, Toronto, Ont. 4-4

For Sale

One S.K.C. Dynamo 2-phase, 60 k.w., 1,040 volts, 133 cycles, 1333 revolutions per minute, including switchboard and instruments, with exciter, Edison 1½ k.w., with spare armature. This outfit can be seen running at plant of the Alliston Electric Light Company, Alliston, Ont.; the reason for selling is that this machine is being replaced by a larger one. 3-6

Notice to Inventors

Inventors or others interested in life-saving devices, are hereby invited to submit to the Company, plans, rough drawings, or models of any device to be used upon the cars for the prevention of accidents.

All communications on this subject should be addressed, and plans and models submitted, to the Master Mechanic of the Company, at his office, foot of Sherbourne street, Toronto.

JAMES GUNN, Superintendent,
5-5 The Toronto Railway Company.

Positions Wanted

Technical graduate, M.M.E., member A.S.M.E., C.S., and C.S.C.E., of wide experience in both United States and Canada in hydro-electric work, power generation and electric transmission and electric railway work, desires business association for consulting and contracting practice, or to become associated with an electrical industry as engineer or manager. Box 252 Electrical News, Toronto, Ont. 5-5

Positions Vacant

Experienced Salesman wanted to handle high class electrical specialties in Canadian territory. Must have energy, ability and an extensive acquaintance with the supply and contracting trade. Address with full particulars, Box 263, Electrical News, Toronto, Ont. 5-5

Agent Wanted

See advertisement on Page 136 Phoenix Dynamo Manufacturing Company, Limited, Bradford, England. 5-5

WANTED—Draughtsman or Engineer thoroughly experienced in the design of hydro-electric power plants and transmission lines. Apply, stating education, experience, present occupation and salary expected to the General Manager, The Lake Superior Power Company, Sault Ste. Marie, Ont. 5-5

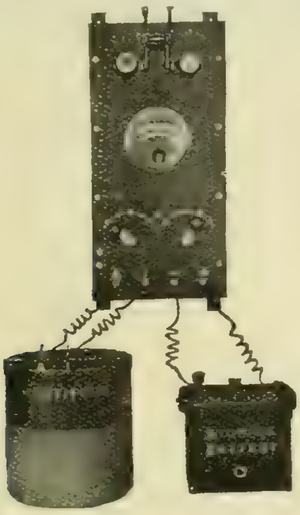
Miscellaneous

One thousand guaranteed $2 nickled pocket ammeters for testing batteries, in chamois leather cases, 25 cents postpaid. Auto Repair Company, 521 23 West 144th Street, New York. 5-5

Trade Publications

Fan Motor for A.C. or D.C.—Circular number 1165 and folders by the Westinghouse Electric and Manufacturing Company, descriptive of motors of various types. Well illustrated.

Rectifying Sets—Pamphlet issued by the Mohawk Electric Company, Albany, N.Y., descriptive of their rectifying



sets for charging storage batteries from alternating current circuits. Type G rectifier, shown herewith, comprises transformer, electrolytic rectifier, hot-wire ammeter, one fine and one coarse regulating switch.

Electrical Fittings for Power Plants—A catalogue issued by the Electrical Engineers Equipment Company, of Chicago, covering their complete line of fittings. The catalogue is well illustrated and contains much interesting information.

The Copper Clad Handbook—issued by the Duplex Metal Company, Chester, Pa.—an interesting description of the many uses to which copper-clad wire is now being put, with comparative figures on tensile strength, conductivity, etc.

The Westinghouse General Utility Motor—A booklet issued by the Canadian Westinghouse Company, Hamilton, indicating the various uses to which their small motor may be put, such as driving sewing machines, brushes, knife sharpeners, ventilators, etc.

Canadian Westinghouse Company, Limited—Circular number 1118, describing their type C.C.L. polyphase inductive motors, squirrel-cage rotors, constant speed.

The Parmenter Fenders and Wheel Guards—illustrated bulletin issued by the Parmenter Fender and Wheel Guard Company, Boston.

Verity's Limited—Catalogues on electric fans, inverted arc lamps, Z lamps, water heaters, Wright-relieving contact gears and searchlights. Central Electric and School Supply Company, Toronto, Canadian agents.

National Metal Moulding—Catalogue issued by the National Metal Moulding Company, of Pittsburg.

Switchboard Indicating Instruments—Catalogue No. 16, issued by the Weston Electrical Instrument Company, through their Canadian office, Mr. A. H. Winter Joyner, 6 Wellington street east, Toronto.

Rollway Bearings—The Roller Bearing Journal-Box—a descriptive booklet published by the Railway Roller Bearing Company, of Syracuse, N.Y., explaining the different features of their anti-friction journal-box in its various uses. Illustrated.

Electrical News

Generation, Transmission and Application of Electricity

PUBLISHED MONTHLY BY

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ADVERTISEMENTS.

Orders for advertising should reach the office of publication not later than the 20th day of the month preceding date of issue. Changes in advertisements will be made whenever desired, without cost to the advertiser.

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Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 20 Toronto, June, 1911 No. 6

Active vs. Protective Assistance

At the present time when strong opposition is being raised, and especially by the manufacturing interests, to the reciprocity arrangements as outlined by our Dominion government, it seems an opportune moment to consider whether in the probable event of the ratification of the agreement by both nations, there cannot be found some workable and effective alternative by which the manufacturers of Canada may receive as good or better assistance than that afforded by a protective tariff. In outlining a plan of government assistance a little later in this article, we wish it to be understood that this is not intended in any sense as an argument in favor of reciprocity. While such a plan as we outline would, we believe, be very effective by itself, it doubtless would be more so supplemented by our present protective system.

One of the most forceful arguments that has been advanced by the manufacturers themselves in favor of a continuance of the present protection arrangements is to the effect that our products have not yet reached that condition of economy in manufacture, and, in some cases, that high standard of quality which is necessary for successful competition against the output from the older established factories of the United States and the European continent. There is probably some truth in this. It would appear, therefore, that the protective system of the past, which at best is a negative, passive kind of assistance for the manufacturer and no help to the consumer, is not, in itself, of sufficient constructive value to place the growing manufacturers of Canada on a sufficiently high plane. The whole matter can well be resolved into a question of quality. Certain lines of electrical products, for example, of our own continent, fear competition with the old world, not so much on account of labor conditions, that argument so often advanced, as on account of the wonderful excellence of the finished article. And wherein does this difference lie? Why does it exist? It is plainly not the fault of the individual manufacturing concerns, for these, driven by competition, have spent, where they had it, immense sums of money on experiments, improvements and extensions, and, entirely to their credit, have always succeeded in taking a prominent place in world competition. But this applies to too few in Canada, for too few have had the means to make the necessary researches and experiments from which such progress follows, and the government has given them only sympathy (protection). The result is that the standard of excellence of Canadian products—the average—has not been raised as quickly as it would have been if such active co-operative government assistance as is given in many other countries had been extended to the struggling Canadian manufacturer.

The alternative is active, helpful, upbuilding government assistance, such as would enable the manufactured products of Canada to compete along side of the most highly finished product of the whole world. Then the cry of "Made in Canada," which at best is only half right, would be forgotten and Canadians would buy Canadian products because it would be impossible to get anything better by going away from home. There can never be any loyalty slogan half so effective as "Canada's product the best."

The German government has probably done more towards the active assistance of its manufacturers as a whole than any other government in the world. In England a system modelled somewhat on the German idea, but less specialized, is in operation. In the United States a start has been made in the Bureau of Standards. In Canada the Electrical Standards Laboratory, with a decidedly narrow scope of operations, corresponds closely with the proverbial mustard seed, which has scarcely, however, begun to germinate.

The German plan, on the other hand, is comprehensive. It stands ready to assist every kind of manufacturer and every kind of purchaser. Government laboratories are open to all and are equipped with apparatus for making the most exhaustive tests, operated by specialists whose signatures are recognized and accepted by the whole nation as authoritative and final.

As an example of an actually operating co-operative system which our own government, at this juncture, might do well to use as a pattern, we outline herewith briefly the German plan of general government assistance to their own national industries. Two types of governmental laboratories are especially worthy of notice.

I. The Reichsanstaldt at Berlin—this is essentially a standardizing laboratory for standardizing meters, units of length, weight, volume, etc.; units of e.m.f., resistance, current, etc. At this laboratory, also, improved methods of standardization are investigated; in fact all work which will tend in any way towards the increasingly accurate determination of the various units and their general recognition and use by the whole nation, is performed here.

II. The Royal Material-Testing Institute at Gros Lichterfeldt—this institute has the following functions:

(1) To produce and perfect in the public interest, the methods, machines, instruments and apparatus for the testing of materials used for practical purposes.

(2) To conduct tests on materials and construction parts and set forth the results by official certificate and opinions.

(a) In the public or scientific interest so far as the means are available either through state or private contribution.

(b) In consideration of the payment of a set fee for any one (official or private) who may bring work to be examined.

(3) At the request of two parties to act as arbitrators in matters of dispute over the testing and quality of materials and construction parts used for practical purposes.

This Institute has six departments as follows:

1. For metal testing—in which tests are conducted chiefly on materials and construction parts of machine building; also investigations of all kinds on lasting qualities; physical tests, investigations on testing-machines, apparatus, etc.

2. For building-material testing—in which tests are conducted on materials and construction parts in the department of building such as stone, building materials, mortar, etc., for fitness and stability; also roofing, fireproof materials, wearing qualities and temperature tests are undertaken, and contrivances and implements for such testing are examined and compared.

3. For paper and textile testing—in which tests are conducted on paper and other fibre textures (raw material, semi-prepared, or the finished product) as to their characteristics and peculiarities, and especially the testing of paper for practical purposes.

4. For metallography—in which tests are conducted, especially on the metallographic, microscopic, chemical and physical properties of iron and other metals.

5. For general chemistry—in which tests are provided for on the chemical analysis of materials used for practical purposes in particular, the determination of heat values of fuels, etc., water analysis, ore and metal examinations, composition of paints, inks, etc.

6. For oil testing—in which tests are conducted on the chemical and physical properties of oils, fats, soaps, etc.

In the application of the above plan to Canadian requirements it will be seen that there is already at Ottawa the nucleus of the Reichsanstaldt—the standardizing department. Here all units of whatever kind would become standardized. More accurate methods of standardizing would always be under research as well as the devising of apparatus to perfect the methods of standardization, working always towards increased accuracy in the standards.

One Testing Institute could be located in, perhaps, the chief manufacturing centre of each Canadian province. The functions of the institute might vary from province to province, depending on the particular requirements of the locality. Indeed, it would probably happen that each provincial institute would become specialistic in one or more particular lines of testing as required most by the manufacturers of that province and as a result much information would be interchangeable among the provinces.

The magnitude of the electrical interests in Canada, however, would require the addition of a seventh department in most, or perhaps all, of the provincial institutes. These, if located fairly centrally, would be within comparatively easy reach of the various sections of each province and would have charge of such work as meter testing, testing of storage batteries, dynamos and motors for efficiency, [illegible] installation of various kinds, transmission lines, power plants, lighting systems, etc. This work must of necessity be under the control of the best obtainable men, so that the Institutes' reports and certificates, being in effect recognized government reports, would represent the final word to be said on all questions in dispute.

It is also an important factor in the consideration of the above plan that such a system would fit in to good advantage with such a scheme of Industrial Schools as has been outlined by Dr. Seath, Ontario's Superintendent of Education. Dr. Seath's plan was reviewed at length in the April issue of the Electrical News and consists chiefly in the establishment of certain Industrial Schools or classes in various centres throughout the province where instruction of a practical and technical nature shall be given to such as in their daily work have special need or desire of more advanced information. For example, it is difficult at first sight to see where the proper type of man for instructor will be found for Dr. Seath's schools, on which would hinge the success or otherwise of the scheme. In the event of the establishment by the Dominion government of such provincial institutes as described above, however, the practical applicability of both the Institute and the Technical Schools suggests that teachers for the Technical Schools would receive the best possible training for their work as assistants in the Testing Institutes.

The Toronto Civic Lines

The Ontario Railway and Municipal Board has expressed its unwillingness to give consent to the construction of outlying electric lines by the city of Toronto until detailed information has been furnished as to cost, streets, probable revenue, etc. While it is very unlikely the board will long withhold its consent to the commencement of construction work if the city really wants to go ahead, it is evidently the feeling of that body that the electorate should be given as accurate information as possible on the probable financial outcome of such a venture. The board will manifestly have done its duty if it points out to the citizens that such lines are very unlikely to pay expenses if operated as separate units. Steps are now being taken by the city to ask the board to compel the Toronto Street Railway to co-operate in some way, such as by giving running rights or by themselves operating the lines.

Co-operating with the Municipalities

The Electric Power Company, Mr. J. H. Larmouth, general manager, with headquarters at Belleville, has inaugurated a very generous and helpful policy in connection with the numerous towns and municipalities it serves throughout the Trent Valley district. The company offers to supply free of charge, for three years, sufficient electric current to operate one 60 watt tungsten lamp for every fifty inhabitants up to 5,000, and one 60 watt tungsten lamp for every 100 inhabitants above 5,000. These lamps will, of course, be used for decorative lighting or advertising purposes. The offer amounts, for the smaller centres, to practically one candle power for each inhabitant.

The municipalities in the Trent Valley district are fortunate in being served by a company which has the interests of the district so much at heart, as it is evident that nothing could be done which would more likely tend to make this section a popular manufacturing section.

Rich Tungsten Mines in Nova Scotia

The recent discovery of tungsten in Nova Scotia has greatly interested the steel and metal manufacturers both here and abroad. The mines are located on Moose River, about 30 miles from Halifax, and it is claimed that the veins in number and richness exceed those of any other discovery. So far the mines have been merely prospected, with a yield of scheelite amounting to 75 tons, valued at $30,000.

Tungsten has been until recently considered one of the rare metals, but during the last few years has become generally useful and is largely used by metallurgists, dyers, silk manufacturers, and those who produce the tungsten lamps. Being hard to fuse, it is an ideal metal to use in making all kinds of steel, armor plate, etc. It is only within the last few years that tungsten has been recognized as an important element in the commercial world, and prior to 1900 only a small quantity was required in the industries. The discovery of its advantage in the manufacture of tungsten steel and electric filaments changed the situation and stimulated its production. Prices have advanced rapidly, and, even with the increase, consumers find it difficult to secure sufficient quantity to meet their requirements.

Trade of Canada

His Majesty's trade commissioner for the Dominion of Canada, Mr. Richard Grigg, has just made a report to the Board of Trade, at London, England, on the trade of the Dominion of Canada for the period from July 1, 1906 to March 31, 1910. The report covers nearly every phase of Canadian operations and is divided roughly into three parts:

(1) A general survey of the economic conditions of the Canadian market.

(2) The import trade of Canada.

(3) A survey of particular branches of trade.

The power development of Canada is dealt with at some length, and attention is drawn to the important part which electrical energy generated from water power is destined to play in the evolution of industrial life in Canada. A table of electric light and power rates covers a number of the most important towns in Canada. The water power available in each province and the present horse power utilized is noted, and the undertakings of the hydro-electric power commission of Ontario are briefly explained. Mention is also made of a number of the undeveloped water powers in different parts of Canada.

Production of Pig Iron by Electricity

The Daily Consular and Trade Reports contain the following item:

On November 15, 1910, the Swedish Government commenced operations in the experimental production of pig iron by electricity on a scale sufficiently large to be considered of commercial magnitude and to approximate closely the conditions of actual commercial manufacture. Without good coal, and facing a rapid diminution in the supply of wood available for charcoal, the Swedish iron industry has felt that its salvation lies in smelting with the cheap electric energy developed from the country's abundant water power.

A contract was entered into with the directorate of the water power at Trollhatten to take 3,000 horsepower per annum for three years at $2,680 per year, and this contract was guaranteed by the Crown. The installation is designed to produce about 20 tons of pig iron every 24 hours or, with continuous operation, 7,300 tons per annum. About 30 men are employed.

The utmost secrecy prevails regarding the operations, and no official news of the results is expected for some months. The local press, however, has stated that the operations of the experimental plant have completely fulfilled all expectations and have proved that ore can be electrically reduced with a saving of two-thirds of the coal used in the old-style blast furnaces.

There seems to be a feeling among iron manufacturers that the experiments are proving the practicability of the process, and it is reported that other furnaces are being planned. It is hoped that by the end of 1911 there will be at least four electrical blast furnaces in operation, producing at the rate of 30,000 to 35,000 tons of pig iron per year on a consumption of 12,000 electric horsepower.

It is reported that tests have been made of the Trollhatten electric pig iron at a mill in Lotorp. These tests proved that the wire intended for wire rope is of specially even and good quality.

Hamilton's Industrial Day

Hamilton's Board of Trade this year inaugurated a scheme which cannot fail to be conducive of great benefits to the manufacturing interests of that busy town. At the request of the Board of Trade nearly all the larger industrials agreed to allow deputations the privilege of going through their plants. The Board of Trade provided automobiles and conductors and took several deputations of influential citizens and manufacturers who visited certain factories in which they were particularly interested. The Canadian Tungsten Lamp Company factories were visited by a large number of deputations and all were pleased at the very complete equipment they found there. All sections of the works were thrown open on this occasion and the laboratory and the various processes of grinding, squirting, treating and mounting filaments were watched with great interest. All who took part in this Industrial Day report that everywhere they were received with great courtesy and kindness and it was unanimously decided to make it an annual affair, as it was considered that this method of educating citizens in the various manufactures of their town must have a beneficial effect.

100,000 Volts, Shawinigan to Montreal

Work has just been commenced by the Shawinigan Water & Power Company on the construction of an electrical transmission line from Shawinigan Falls to Montreal, a distance of about 85 miles. This line will consist of two 3-phase circuits. A new receiving and distributing station is now being erected by the company, near their other east-end station at Maisonneuve, as the Montreal terminal of this new line. The cable used will carry 100,000 volts and be capable of furnishing the equivalent of 25,000 h.p. This amount will constitute the first instalment of a contract made by the Shawinigan Company to furnish the Montreal Light, Heat & Power Company with 60,000 h.p. The new line between Shawinigan and Montreal will follow closely the line of the C. P. R. between those points, and for the greater part of the distance will be about ten miles from the line built a few years ago, which lies close to the Canadian Northern Railway. The construction work will be done entirely by the company's own staff. The line will be carried on steel towers and it is hoped to have the work completed during the present season. When this line is completed the company will be ready to build another line to furnish the balance of the power contracted for with the Montreal Light, Heat & Power Company.

Extension to C. W. & L. E. Road

At the annual meeting of the Chatham, Wallaceburg & Lake Erie Railway Company the finances of the road were shown by manager Morris to be in a very satisfactory condition. Extensions to Blenheim & Dresden were discussed.

Annual Convention A. I. E. E.

The annual convention of the American Institute of Electrical Engineers will be held this year in Chicago, from June 26 to 30, inclusive. The sessions will be held in the new Hotel Sherman.

Toronto Section A. I. E. E.

The Toronto Section of the American Institute of Electrical Engineers were given an unusual treat at their May meeting, when Dr. Charles P. Steinmetz, chief electrical engineer of the General Electric Manufacturing Company, Schenectady, lectured in the Engineering Building, University of Toronto. Dr. Steinmetz's lecture dealt chiefly with the conditions existing in the atmosphere which surrounds an electrical conductor.

Contracts Let for Porcupine Plant

Contracts have just been let by Messrs. Ross & Holgate, Montreal, for a hydro-electric plant at Porcupine for Mr. E. A. Walberg. The electric machinery will be supplied by Canadian Westinghouse Company, of Hamilton, Ont., and two 3,500 h.p. turbine wheels will be furnished by Messrs. S. Morgan Smith Company of York, Pa. The plant is being put in in connection with the operation of gold mines at Porcupine. At this point Mr. Walberg states there is a head of 110 feet.

New Manager for Copper Company

Mr. J. E. McAllister, who has been general manager of the British Columbia Copper Company for the past seven years, has resigned to become a member of a firm of consulting mining engineers, New York City. He will still be connected with the British Columbia Copper Company in the capacity of consulting engineer. Mr. E. G. Warren, former smelter superintendent for the company, has been promoted to general manager.

New Switchboard for Quebec R. H. L. & P. Co.

The Quebec Railway, Light, Heat & Power Company is installing a new switchboard, which will be one of the most complete city improvements in the Dominion of Canada, and will be used for distributing all light and power used in the city of Quebec and for controlling the power obtained from the steam plant, the Chaudiere plant, the Jacques Cartier plant, Montmorency Falls plant and the New Steps plant on the Montmorency river. The switchboard will cost $[illegible]5,000.

Motor Generator for Fort William

The Fort William Coal Dock Company, Fort William, Ont., is installing a new motor generator set. The motor is an induction type, having a normal rating of 200 h.p. The generator has a normal rating of 300 kw. or 400 h.p. The coal docks require 400 h.p. for 17 seconds twice a minute, and the motor generator is equipped with a 10-ton flywheel. The 400 h.p. two-times in each minute, for a period of 17 seconds, will be obtained by purchasing from the Kaministiquia Power Company, on the flat rate basis, 200 horse power. Mr. R. S. Kelsch, Montreal, is acting for the company.

Electric Railway Through Stanley Park

The Electric Railways Construction Company has made a proposition to the city that a line of electric railway be run through Stanley Park (about eight miles), the city to supply the right-of-way, the company to supply the money, and each to take one-half of the profits and at the end of twenty-one years the city to become sole owners. The board of management will comprise two representatives from the city, two from the stock holders and one from the bondholders. The city engineers would fix the salaries of the operating staff.

Development Work Complete at Big Chute

The Simcoe Railway & Power Company, which has just completed its development at the Big Chute on the Severn river, will, in a week or so, commence its commercial service. The power system, including the lines of the Hydro-electric Commission, which has contracted for 1,500 horse power, will serve Midland, Penetang, Victoria Harbor, Coldwater, Barrie and the adjacent districts. It is expected that next month a full description of the plant will be available. Mr. W. Finlayson, of Midland, is the secretary of the company, and Messrs. C. H. & P. H. Mitchell, Toronto, are the engineers.

Toronto System Controlled by Commission

Toronto's municipal lighting and power system is to be controlled by a commission of three members composed of the Mayor, ex-officio, one member appointed by the city council, and one member appointed by the Ontario Hydro-electric Power Commission. The three members of the commission at the start are Reginald Geary, barrister, Mayor; P. W. Ellis, manufacturer, representing the city council, and H. L. Drayton, corporation counsel for the city of Toronto, representing the Hydro-electric Commission. The commission have had a number of meetings but are not following a policy of publicity in connection with the matters discussed. Mr. K. L. Aitkin, the city's chief electrical engineer, will act as secretary to the board.

Progress on New Steam Plant for Winnipeg

Construction work is in charge of Pratt & Ross, architects and engineers. Contract has been let to G. H. Archibald, Winnipeg, for the concrete and brick work and to the Don Bridge Company for the steel work. A feature of the plant will be a reinforced concrete coal hopper, an innovation in Canada, with link belt conveyor system for coal and ash handling. The chimney will be of reinforced concrete, 250 feet high, 13 feet internal diameter at the top and 24 feet at the base. The contract for the chimney has been let to the Kellogg Company, New York. Fenestra sash will be used throughout. A 30-ton Whiting crane has been ordered.

Pile driving for the foundation walls has begun, also work on the pump pit for condenser pumps is under way.

Reciprocity with the United States

The Canadian National League, which has come into being as the result of the opposition to the reciprocity agreement with the United States, now before parliament, has issued a pamphlet called Canadian Nationality, British Connection, and Fiscal Independence. In this pamphlet it is pointed out how the policy which has been pursued in Canada for more than thirty years is reversed by the reciprocity agreement with the United States, and how com-

mercial and political union with the United States would follow. The objects of the league are stated to be, to oppose the adoption of the proposed reciprocity agreement between Canada and the United States of America, and to support such measures as will uphold Canadian nationality and British connection, preserve our fiscal independence and continue to develop our present nationality—the policy of interprovincial and external trade under which the Dominion has achieved its present prosperity. The chairman of the league is Z. A. Lash, K.C.

Prince Albert will Install Three Generators

The city of Prince Albert, Saskatchewan, is calling for tenders on the general works of the La Colle Falls Hydro-electric development. The present work includes the dam across the North Saskatchewan river, a power canal intake, ship canal intake, combined power and ship canals, overflow, power station, tail race, and lock. The works are at La Colle Falls, about 25 miles east of Prince Albert. The Dominion government is requiring the construction of a ship canal, with locks, to parallel the river. The initial portion of the machinery in the power station will include three power generators anad two exciters, all driven by slow speed vertical turbines. The transmission line will be approximately 25 miles long, at 33,000 volts, terminating at a receiving station to be built on the river front at Prince Albert. The initial output will be about 3,200 horse power. Messrs. C. H. & P. H. Mitchell, Toronto, are the engineers. Andrew Holmes is Mayor, and C. O. Davidson is secretary-treasurer, of Prince Albert.

Lethbridge Reduces Rates

Because the gross revenue for the year 1910 was about $25,000 greater than in 1909, while total expenditures were some $9,000 less, Superintendent Reid, of the municipal light and power system, has recommended a substantial reduction in rates. The following is the recommended schedule:

Flat rates—20 h.p. to 50 h.p., $30 per h.p. per year, payable monthly in advance, 10 per cent discount; 50 h.p. up, $28 per h.p. per year, payable monthly in advance, 10 per cent. off.

Power rates—50 to 100 kw.h., 7c. per kw.h.; 101 to 250 kw.h., 6.5c. per kw.h.; 251 to 450 kw.h., 6c. per kw.h.; 451 to 650 kw.h., 5.5c. per kw.h.; 651 to 850 kw.h., 5c. per kw.h.; 851 to 1050 kw.h., 4.5c. per kw.h.; 1051 kw.h., and up, 4c. per kw.h. 10 per cent. discount.

Lighting rates—Up to 100 kw.h., 11c. per kw.h.; 101 to 40 kw.h., 10.5c. per kw.h.; 401 to 700 kw.h., 10c. per kw.h.; 701 kw.h. and up, 9c. per kw.h. 10 per cent. discount.

Meter rents have been abolished, and the minimum rate will be $1.00 per month.

Electric Equipment for Pulp Mill

The Wayagamack Pulp & Paper Company, Three Rivers, Que., have recently placed an order with the Lancashire Dynamo & Motor Company, Limited, for the complete motor equipment for their new pulp and paper mill at Three Rivers. The equipment comprises forty-four motors of various sizes up to 400 h.p., together with starting equipment for the same. The motors are mostly of the squirrel cage induction type. The starting apparatus in many cases consists of totally enclosed auto transformer starters with "no voltage and overload" releases, in some cases, however, "star delta" totally enclosed starters being supplied. The motors are all being manufactured by the Lancashire Company.

The switch-gear is specified to be manufactured by Messrs. Eckstein, Heap & Company, of Manchester, England, whose agents in Canada are Messrs. Chapman & Walker, Toronto. Messrs. Eckstein, Heap & Company have also received through their agents the order for the main switchboard for controlling the whole plant.

Montreal Company will Lay Cable

The Montreal Light, Heat & Power Company has decided to install 450,000 feet of electric cable duct in the city this summer. Work will be commenced immediately and carried out by Mr. G. M. Gest. The Canadian British Insulated Company, Limited, of Montreal, have received the contract for the power cable to be used in this connection, the total value of which will amount to about $100,000.

The work about to be undertaken includes the laying of four distinct branches of the service. The most important perhaps is the section to be laid for the purpose of completing the line between the central power station on Wellington street and the Mentana street station. The second line will be between the central station and the Shawinigan Power Station and will lie principally along Craig and Notre Dame streets. The third line will be on Ontario avenue above Sherbrooke street, and will be for secondary distribution. The fourth line will be a new conduit from Chenneville street to connect with the duct line already down in St. Alexander street.

April Progress Note on Winnipeg Municipal

At Point du Bois—Messrs. John Gunn & Sons have practically completed the work on the power house buildings. Rock excavation is completed at 8-foot falls. Of structural steel the rack frame in front of the present building has been erected. Transmission line anchors have been placed on the roofs of the arrester chamber. Messrs. Jens Orten Boving have erected the 5-foot valve for No. 1 exciter and penstock connection therefor and have practically completed the assembly of the main turbine unit No. 1. Messrs. Vickers, Sons & Maxim are erecting the exciter generators and the alternator at unit No. 2. No. 3 generator is now under test in England. The Canadian Fairbanks Company have almost completed the erection of the oil and water system. Messrs. Cotter Bros. have made good progress in the erection of auxiliary lubricating system, being supplied by the Canada Foundry Company. Canadian Westinghouse Company have made good progress in placing odd details about the barriers and on the walls of the building, and are busy putting in the various switches. Canadian General Electric have a small staff placing the conduit for the light, heat and power distribution throughout the building.

Transmission line—The Williamson Construction Company have made fair progress in the stringing of cable. Painting of towers has been carried on throughout the month.

Terminal station—Fair progress has been made. The Canadian Westinghouse Company have erected the high tension switches in the upper floor of the building. All the weather-proof wire has been delivered by the Eugene F. Phillips Company, making a total of 300,000 pounds. 761 poles have been accepted from the Northern Electric Manufacturing Company, leaving about 1,800 yet to be delivered. Westinghouse Company have practically completed the erection of material in sub-station No. 2. Good progress has been made at sub-station No. 1. The steel for the ground floor is practically all in place and is being rivetted up. Of the conduit system 48,000 duct feet have been shipped by the H. B. Camp Company. (Abstract from monthly report of Mr. W. G. Chace, of Smith, Kerry & Chace, consulting engineers).

Montreal Notes

Mr. J. V. E. Titus, vice-president of the Electric Service Supplies Company, of Philadelphia, was in Montreal recently, where he was the guest of Messrs. John Millen & Son, Limited.

Mr. R. Edwards, supply sales manager of the Northern Electric and Manufacturing Company, Limited, is on a business trip to the Pacific coast and principal cities in Western Canada.

Mr. Roswell P. Smith, formerly with the Lombard Governor Company, and now with the S. Morgan Smith Company, of York, Pa., was a caller at the office of the Electrical News, B-34 Board of Trade Bldg., Montreal, recently.

An electric sign on a railway train is the latest innovation to be adopted by the C. P. R. The last cars on the Imperial Limited trains, known as observation cars, are to be furnished with illuminated signs reading: Imperial C.P.R. Limited. The lighting will be the "Stone" system.

Progress on the Electric Power Company's System

One of the largest individual loads carried by the Electric Power Company is at the Lehigh mill of the Canada Cement Company near Belleville, which has now been fully equipped with motors so that the entire mill is operated electrically from the lines of the Seymour Power & Electric Company. The electrical equipment of the mill includes four 600 h.p., 550 volt, 3-phase, 60 cycle, squirrel cage induction motors belted to sections of shafting in the mill. There are also a number of smaller motors having a total capacity of about 1,000 h.p. scattered through the mill. An 800 h.p. synchronous condenser has also been installed, mainly for the purpose of power-factor correction, but incidentally it drives a small direct current generator. The four 600 h.p. induction motors replace two St. Louis Corliss engines of approximately 1,000 h.p. each.

The power for operating the cement mill is furnished at 600 volts from the Seymour Power Company's sub-station, located right on the Cement Company's property. This sub-station consists of a very substantial fireproof building of poured concrete and contains four 750 kv.a. 3-phase, water-cooled transformers, which step down from 44,000 to 600 volts.

The remaining equipment in the sub-station consists of the necessary switchboard for control of the transformers, large motors and other feeder circuits, oil tank, motor driven turbine pumps for supplying cooling water to the transformers, etc. Two 44,000 volt lines enter the sub-station, to both of which are connected aluminium cell lightning arresters for the protection of the apparatus. All of the electrical equipment in the sub-station and cement mill was furnished by the Canadian General Electric Company.

Power is supplied from the power house of the Seymour Power Company at Campbellford, about thirty-five miles away, where the normal rated capacity of 3,000 kilowatts is now fully loaded. In addition this company is also utilizing to its full rated capacity the 1,000 kw. generator recently installed in the plant of the town of Campbellford, the output of this generator being transmitted at 2,400 volts to the larger station about a mile lower down on the Trent river, where the output of both power houses is stepped up to 44,000 volts. Transmission is then made at this voltage over one hundred and fifty miles of line to ten different substations, the number to date in operation.

The transmission system is now being rapidly extended west from Belleville to Oshawa. Thirty miles of this line is already in operation and supplying energy through the Brighton and Colborne substations. Substations at Cobourg, Port Hope, Newcastle, Bowmanville and Oshawa are all rapidly nearing completion and will be in operation within the next few weeks. A transmission line is also being pushed east to Deseronto, where a sub-station will be in commission during the present summer.

Owing to the fact that the present generating plants are practically operating at full capacity while the demand shows every evidence of continuing to increase rapidly, the 5,000 h.p. generating station of the Sidney Electric Power Company at dam No. 2 on the Trent river just north of the town of Trenton is now being pushed to completion and will be in operation during the next few weeks. Also, the power house of the Auburn Power Company on the Otonabee river at Peterborough, which will have a capacity of 3,000 h.p., is well under way and will be in a position to deliver power before the end of the present summer. To insure the various towns around the lake front a supply of power from two different sources, a 44,000 transmission line is being built from Peterborough to Port Hope. The completion of the Auburn Company's station will then insure an increased supply of power for the city of Peterborough as well as providing the towns along the transmission line and a certain amount of power for the towns along the lake front. The town of Millbrook, for example, will be served from the Peterborough-Port Hope line.

The Value of Unification of Small Systems

The various companies above mentioned form part of a large system operated by the Electric Power Company, and the construction work and operation now going on exemplifies the latest trend in connection with the development of large high voltage power transmission systems, where is is aimed to bring about the unification of a number of small plants. In this particular case the various towns and manufacturing plants have been served from small water powers and steam plants in various different ways. For example, electric power in the different towns now covered by this unified system has been furnished according to the following characteristics—d.c. 220 volts, d.c. 125 volts, a.c. single phase, a.c. 2-phase, a.c. 3-phase, 1,100 and 2,200 volts at 60 cycles, 66 cycles, 125 cycles, and 133 cycles. For the new system which is now in operation, 3-phase, 60 cycles has been standardized with 44,000 volts for the main transmission and suitable lower voltages for the local distributions. This permits of the standardization of transformers and other apparatus in such a way that a very small number of types of transformers, motors and other apparatus may be used, these transformers being interchangeable between the different substations, as well as much of the other apparatus being interchangeable, if necessary, between the different municipalities.

The load has been increasing so rapidly on the Electric Power Company's system that further extensive additions to the generating station capacity are now being planned for the year 1912, by which time it is believed that the stations now in operation and under construction will be inadequate to carry the load.

The German Incandescent-Lamp Industry

During 1910 Germany imported 74 tons of incandescent lamps, valued at $220,150, against 135.7 tons, worth $403,648, in 1909; and shipped to foreign purchasers 1,978.2 tons, valued at $11,527,768, in 1910, and 1,655.2 tons, worth $8,666,532, in 1909. Austria-Hungary and the Netherlands supplied most of the imported lamps, and the United Kingdom, Russia, France, Austria-Hungary, Italy, Argentina, Switzerland, and Belgium received the larger part of Germany's exports of these goods.

Electrical Convention at Niagara Falls

Arrangements Nearing Completion for the Twenty-First Annual Convention of the Canadian Electrical Association—Many Interesting Papers

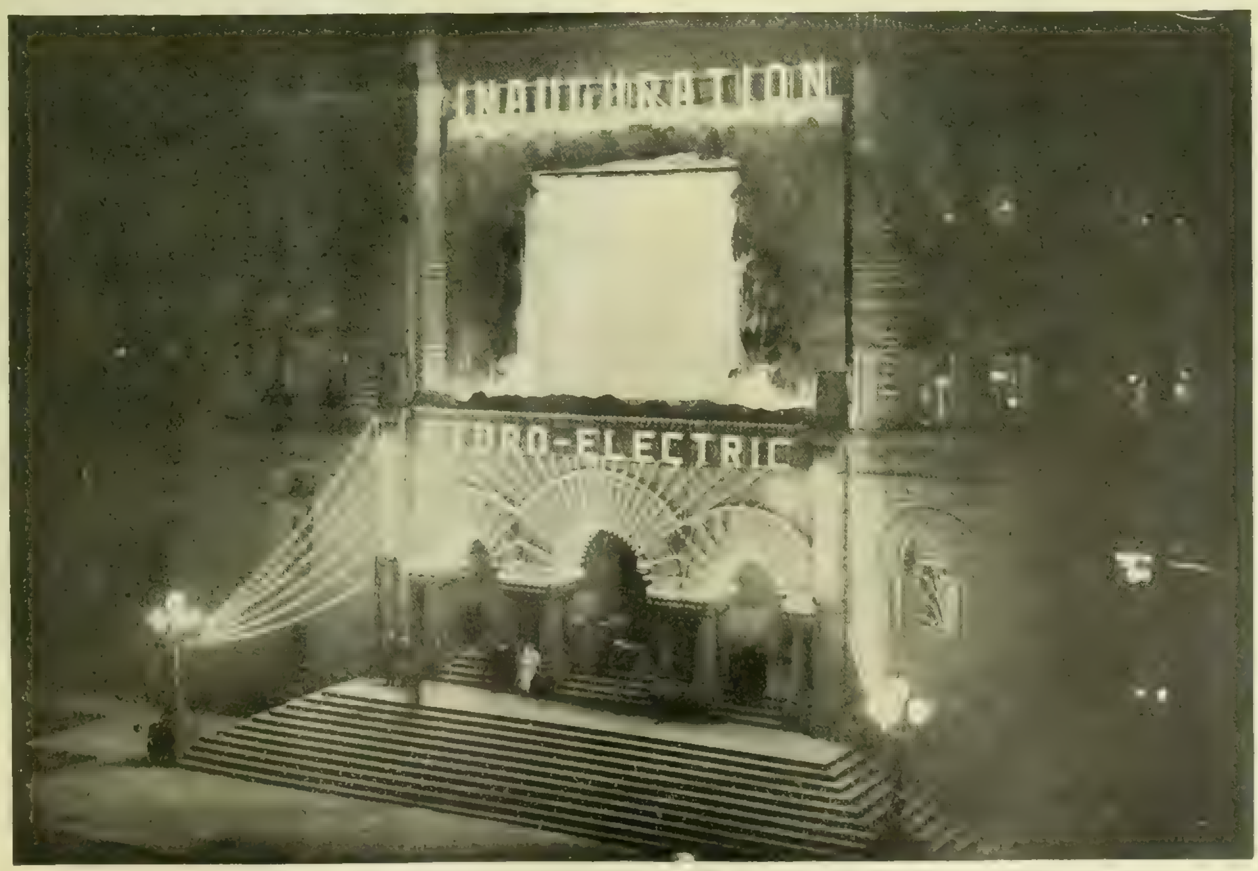
Indications point to a most successful convention of the Canadian Electrical Association at Niagara Falls, Ont., on June 21st, 22nd and 23rd. The attendance is certain to be large and the programme interesting. The entertainment features are in the hands of an active local committee, of which Mr. W. L. Adams, second vice-president of the Association, is chairman.

The convention headquarters will be the Clifton Hotel, that well-known and splendidly equipped hostelry whose location makes it the rendezvous of tourists from all parts of the world. The accommodation it affords for a convention is unsurpassed, but in view of the expected large attendance, the secretary of the association urges that reservations be made in advance, direct with the hotel. There are several other hotels where accommodation can be secured at more moderate rates, such as the Lafayette, Savoy and Trennick.

Niagara Falls, to the electrical man, is perhaps the most interesting place in the world. The water power has been developed to the extent of over 300,000 horse power, and the investment is estimated as high as twenty-five million dollars. These magnificent plants will be thrown wide open to the members and guests of the Canadian Electrical Association.

The most important feature of the convention will be what might be termed the professional or business sessions. Those in charge of this work have an excellent programme, and one which promises to be highly instructive. Mr. Samuel Insull, president of the Commonwealth Edison Company of Chicago, has consented to deliver an address of special interest to central station men. There will be several committee reports, while Mr. W. A. Martin, chairman of the papers committee, has arranged for many interesting papers, among them being the following: "Customers' Terminals," by Mr. Murray, New York; "General Accounting," by Mr. C. E. Bowden, Auditor Toronto Electric Light Company; "Ornamental Street Lighting," by Mr. T. F. Kelly, Contract Agent, Hamilton Electric Light & Power Company; "The Two Rate Meter Question," by Mr. P. T. Davies, Chief Operating Superintendent Montreal Light, Heat & Power Company; "Relations of Public Service Companies to the Public," by Mr. B. C. McNabb, New Business Manager Montreal Light, Heat & Power Company; "New Business," by Mr. P. T. Kemble, General Sales Manager Toronto Electric Light Company; "The Advantages of Publicity to the Central Station Industry," by Mr. Glen Marston, Chicago; "Operating Safeguards," by Mr. E. Little, Operating Superintendent Kaministiquia Power Company, Fort William.

Two other important papers will be: "Physical Data in connection with Incandescent Lighting, comparing 25 cycle with 60 cycle current," and "The Importance of Co-operation Between the Central Stations and the Electrical Manufacturers."



The formal opening of Toronto's Municipal Light and Power System.

Interesting Storage Battery Plate Potentials

by Paul F. Trout

In experimenting to find a satisfactory substitute for the stick of metallic cadmium which is most commonly used in storage battery work when reading the charge on the separate plates, I secured some very interesting results. My purpose in conducting the experiments was to discover a means of taking complete battery readings where it is for any reason impossible to secure a stick of the comparatively rare cadmium. This is of special importance to the man who must install peak-load batteries in isolated plants far from large cities.

I confined my experiments to lead sticks because lead is always available around a storage battery. The sticks were taken in various states of oxidation and the following figures are representative of the readings given by the different sticks. The readings were taken on cells containing Tate Bifunctional Accumulators with electrolyte of specific gravity 1.215.

Cell Nbr.	Volts	Cadmium pos.	Cadmium neg.	Lead Perexide pos.	Lead Perexide neg.	Spengy Lead pos.	Spengy Lead neg.	UnexidizedLead pos.	UnexidizedLead neg.
1	2.74	2.40	.33—	.20	2.52—	2.30	:48 -	2.06	.52
2	2.73	2·40	.32—	.20	2.52—	2.29	.45—	1.90	.50 –
3	2.80	2.38	.38	.20	2.60 -	2.28	.54	1.92	.56 -
4	2.45	2.34	.07—	.22	2.24				
5	2.44	2.34	.06 -	.21	2.23 –				
6	2.44	2.34	.08—	.21	2.24—	**Unsatisfactory and Readings not completed**			
7	2.43	2.34	.06—	.21	2 22—				
8	2.46	2.35	.09 -	.22	2.26 –				
9	2.54	2.34	.18 –	.21	2.35—				
10	2.68	2.34	.31	.21	2.48 -				
11	2 65	2.35	.22	.22	2.45				
12	2.44	2.35	.05	.22	2.21—				
13	2.45	2.35	.08	.22	2.24 -				

As can be readily seen from the figures, spongy lead and unoxidized lead proved so uncertain and unreliable that I soon abandoned them entirely. Lead peroxide was as reliable in giving an indication on the voltmeter as the stick of cadmium. Its one disadvantage lies in the fact that it requires more care in its handling than does the cadmium. I "formed" the lead peroxide stick together with the stick of spongy lead in an electrolyte of a specific gravity 1,400 at a rate of six amperes assisting the Plante formation by the addition of some hydrochloric acid and hydrogen peroxide. I charged in one direction all the time in spite of the fact that to reverse the direction of the current tends to deepen the layer of oxide. I wanted the layer of oxide to be as compact as possible and thought that to reverse the current would result in softening it too much. A deep layer of soft oxide might have increased the uncertainty of the readings.

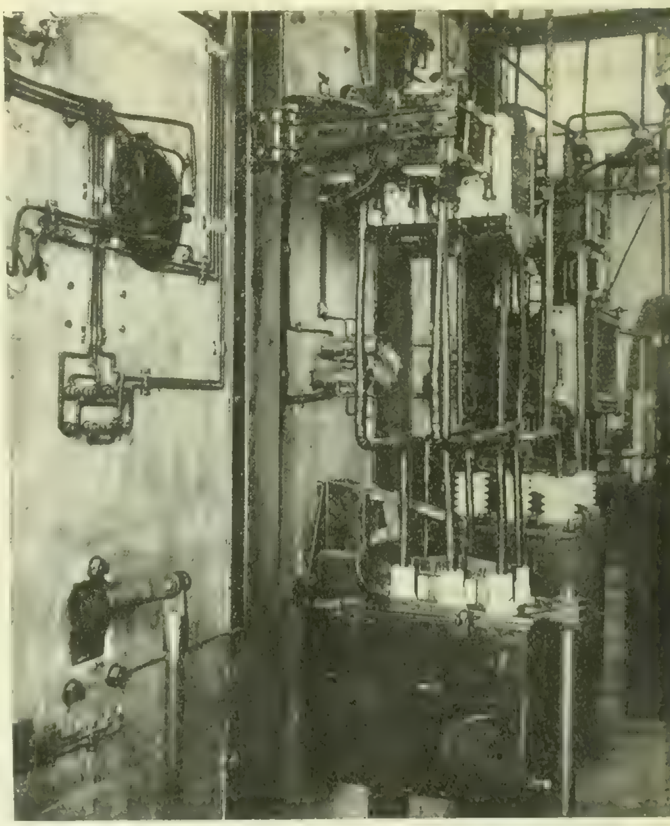
The lead peroxide stick showed some rather peculiar characteristics. For instance, when it was taken out of the 1.400 specific gravity acid and used for a reading, it caused the voltmeter needle to waver up and down the scale in a very unsteady manner. But the reading was steady after it had been washed in dilute acid. It gave the best results after it had been washed in water and dried, retaining its efficiency or capacity to give a steady indication to the voltmeter needle for over an hour after being immersed in the electrolyte. It is useless if kept for any length of time in distilled water. Like the cadmium stick, it must be enclosed in a piece of rubber hose with small holes cut in it to admit the electrolyte. Most battery authorities say that the purpose of the rubber jacket is to keep the stick from touching the sides of the jar or the plates of the cell, but my experiments lead me to the conclusion that its real effect is to minimize the electrochemical action on the stick.

It is interesting to account for the indications which the different [illegible] give to the voltmeter needle First it is well to understand the part which the stick of oxide plays when it is immersed in the electrolyte of a cell. In every case the stick, no matter what its composition, plays the part of a negative plate when used in reading the charge on the positive plate and the part of a positive plate when used to read the charge on the negative plate of a cell. Cadmium sticks are always allowed to sulphate before they are used, thus giving a stick of cadmium sulphate which is, from the chemical viewpoint, a completely discharged plate. From the same viewpoint, lead peroxide stick is a fully charged plate. Consequently, the lead peroxide stick gives readings which are strongly the opposite of those given by the stick of cadmium sulphate, but nevertheless, they are always relatively the same in value. For instance, a given indication by a stick of cadmium sulphate will always be equivalent to a certain indication by a stick of lead peroxide. From this it can be readily seen that it would only require a series of carefully-taken readings to make a table showing the relative values of the indications given by the two sticks all through the course of charge and discharge of a battery.

Power Distribution at Preston

A brief description of the Preston station and distribution equipment of Niagara power follows:

Niagara power is received from the step-down transformer station of the Hydro-electric Commission at 6,600 volts and 25 cycles. It is reduced to 2,200 volts and dis-

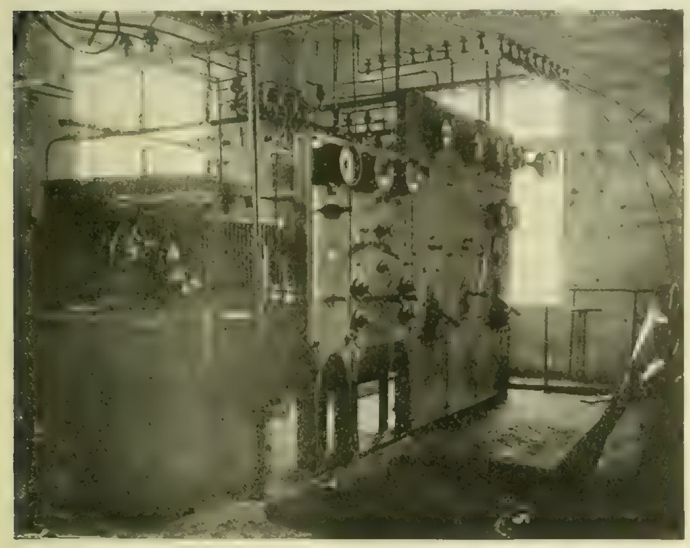


Rear view of Preston switchboard

tributed at that pressure for street and residential lighting and power purposes.

The entire station equipment was furnished by the Canadian Westinghouse Company, and consists of three single-phase, 170 kw., 25 cycle, oil-filled, self-cooled transformers, the primaries of which may be used with 13,200 volts. The street lighting circuit is controlled by a 16 kva constant current transformer designed for 2,200 volts

primary. The switchboard consists of five panels controlling the circuits mentioned above and the high-tension circuit. The station switch is a 13,200 volt, type E, oil switch, installed at some distance from the board. The other switches are attached to the rear of the board as shown in the accompanying cut. The following types are used:—residential lighting panel, 2,200 volt, type B.; street lighting panel, 2,200 volt, type D.; factory power panel, 2,200 volt,



Front View of Preston Switchboard

type F.. The usual indicating instruments are installed with each panel.

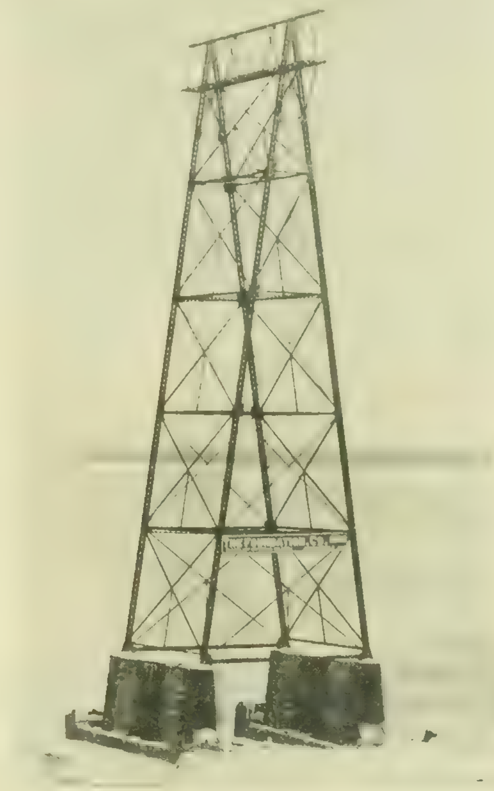
The cuts reproduced herewith show a general view of the switchboard, transformers and regulating transformer, as well as the several switches, potential and series transformers mounted on the rear of the board. The street lighting equipment consists of two hundred and fifty 45-watt series tungsten lamps, installed with reflectors on the poles carrying the different circuits. These are spaced one or two poles apart.

The St. Lawrence River Crossing of the Canadian Light and Power Company's Transmission Lines

A power development of the magnitude of that in which the Canadian Light & Power Company is now engaged always presents new features of interest to the engineer. One of these in this undertaking was the spanning of the St. Lawrence River. This is particularly noteworthy because of the width of the river and the lateness of the season during which the work was carried on.

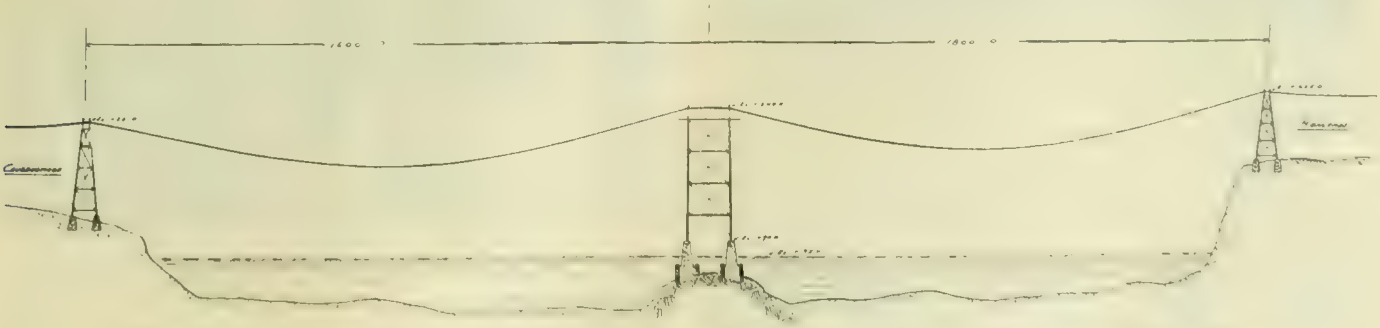
The high tension lines of the company are to extend from the power house at St. Timothee, Que., to Montreal, in all a distance of 26 miles. These lines, consisting of eight cables, are to be carried on steel towers, the economical height and spacing of which was figured to be 52 feet and 500 feet respectively.

While these heights and intervals of towers could be followed throughout the greater part of the distance, the St. Lawrence River, with its depth of water and rapid current, necessitated a special treatment. After an exhaustive study had been made and numerous soundings taken, the company's engineers decided to effect this by erecting on the shore of the river steel towers approximately 130 feet in height, by building at the centre of the river two concrete piers extending about 15 feet above the mean water level, and on these a tower 150 feet in height. The



Tower Placed Midway in St. Lawrence River

point at which the cables are to be carried across the river is located almost 700 feet below the present C. P. R. Lachine bridge. At this spot the river is about 3,400 feet wide. As the soundings had located a shoal in the river only about 200 feet away from the centre, and as the water at this point was only about 12 feet deep, it was decided to erect the river piers at this point. This meant that the span of the cables from the Caughnawaga side of the river would be 1.600 feet, while that from the river tower to the



Diagrammatic Sketch of Transmission Line Across St. Lawrence—Canadian Light and Power Co.

Log Dam 750 Feet Long and 30 Feet High at Yarmouth, Nova Scotia.

Highlands shore would approximate 1,800 feet. These are claimed to be the longest spans in Canada.

The construction work on the above was carried out by the Foundation Company, Limited, of Montreal. Mr. J. D. Evans was engineer-in-charge for the Canadian Light & Power Company.

Electrical Operations in Yarmouth

All the electrical operations in Yarmouth, N.S., the street railway, the lighting and the power, are in the hands of one operating company. Power is obtained from the Tusket river, where a power house was built in 1908. A log dam, shown in figures, 750 feet long and 30 feet high, gives a head of 27 feet. The power house contains a pair of S. Morgan Smith turbines, direct coupled to a 300 kw. C. G. E., 60 cycle, 2300 volt, alternating current generator. The current at the falls is stepped up to 22000 volts and transmitting at that pressure to Yarmouth, a distance of 17 miles, where it is re-transformed to 2300 volts for distribution through the city.

The company operates a 24-hour service and supplies

Dam and Power House, Yarmouth, N. S.

current for about 5000 electric lights and 100 horse power in motors, as well as for the street railway requirements. For the latter the company have installed a synchronous motor of 200 kw. capacity, belted to a 150 kw. direct current 550 volt generator. Three miles of track are operated, using 6 cars, 3 open and 3 closed. It is worthy of note that the Yarmouth Street Railway System is the oldest electric road in the Maritime Provinces. It commenced operation in 1892 and continued to be operated from a steam plant in the city until 1908, when the present hydro-electric plant was constructed.

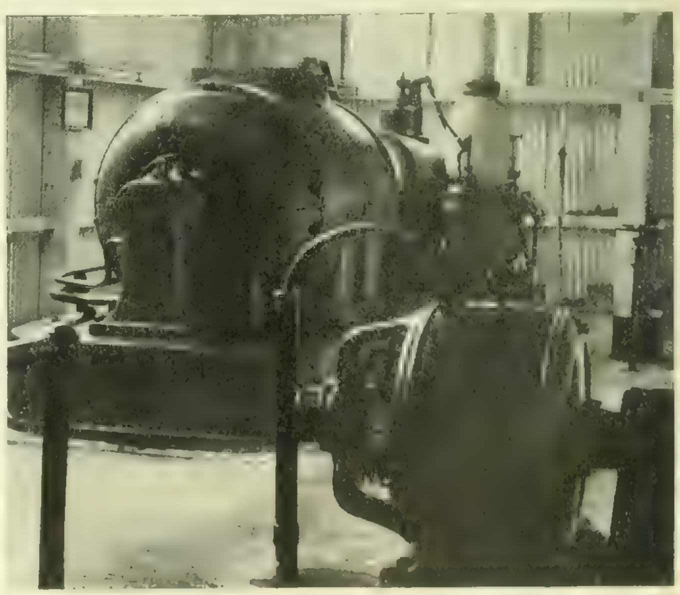
In addition to the hydro-electric plant this company owns an auxiliary steam plant in the city, consisting of a 150 horse power Robb Armstrong, and a 125 horse power Leonard Ball Engine, belted to two 45 kw. Edison type, direct current, 550 volt generators, and a 100 kw. three-phase alternating current generator for lighting. The manager of the company is Mr. B. J. Burrell. Mr. Robert Blackburn is superintendent.

Hanbury Saw Mill Electrically Driven

The recent completion of the sawmill and sash and door plant of J. Hanbury & Company, at Vancouver, B.C., marks the inauguration of one more of those gigantic lumber manufacturing plants which are rapidly giving to the province of British Columbia a foremost place in the lumber producing industry of the world. Mr. John Hanbury, the owner of the mill, already owns and operates large mills in the Kootenay district and at Brandon, Man.

The most important feature of the new mill is the fact that it is entirely operated by electricity. The various uses to which the electric motors are put are described briefly below:

(1) An overhead chain canter looks after the large heavy logs. This canter is driven by a 10 h.p. motor.



Turbo-Generator, J. Hanbury & Co's. Saw Mill, Vancouver

(2) The set works are run by a motor below the floor, running an endless rope

(3) The band mill is a 9 foot double cut, taking saws

15 inches wide and 52 feet long, and is driven by a 200 h.p. special slow starting motor, belted with a 20-inch double leather belt. The heavy band can be brought to full speed in one and one-half minutes.

(4) The edger is a Pacific coast type, 8-inch x 72-inch, with steam lift rolls and is driven by a 100 h.p. motor direct connected to the saw arbor.

(5) The slasher has 24 saws, spaced 12¼-inch centres, to cut all slabs and edgings into 12-inch stove wood, and is driven by a 50 h.p. motor direct connected to the saw arbor, with a flexible coupling.

(6) A 50 h.p. motor drives a 45-inch fan and the live rolls and transfers around the sizer.

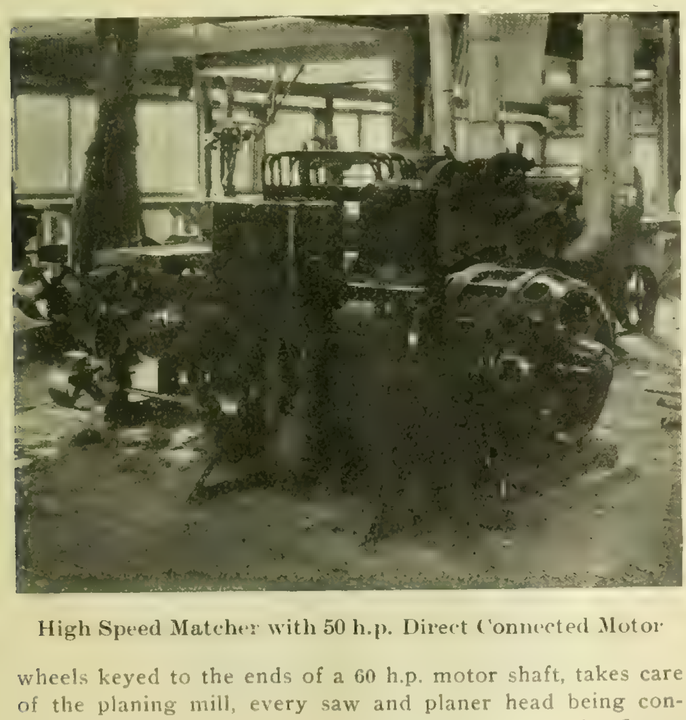
(7) The sizer itself is driven by a 60 h.p. motor direct connected with flexible coupling.

(8) The basement contains a large 200 h.p. motor to drive the big band, a 100 h.p. motor to drive the resaw, three 40 h.p. and three 15 h.p. motors. Each motor has an oil starter and an automatic circuit breaker.

(9) The filing room is situated in the roof of the mill, and is operated by a 7½ h.p. motor.

(10) The planing mill machinery consists of a No. 44 Berlin, driven by a 50 h.p. motor belted to a countershaft, a No. 97X matcher with a 50 h.p. motor direct connected to the countershaft, a No. 4 Berlin sizer 14-inch x 20-inch with a 60 h.p. motor direct connected to countershaft, a No. 108 moulder, Berlin make, with a 25 h.p. motor direct connected, a 54-inch band resaw, with a 40 h.p. motor belted, and a heavy power feed rip saw, with a 15 h.p. motor belted. A 10 h.p. motor drives the filing room machinery and six trimmer saws behind the planers.

(11) A complete dust and shavings system is installed. A double 70-inch Sturtevant slow speed fan with the two

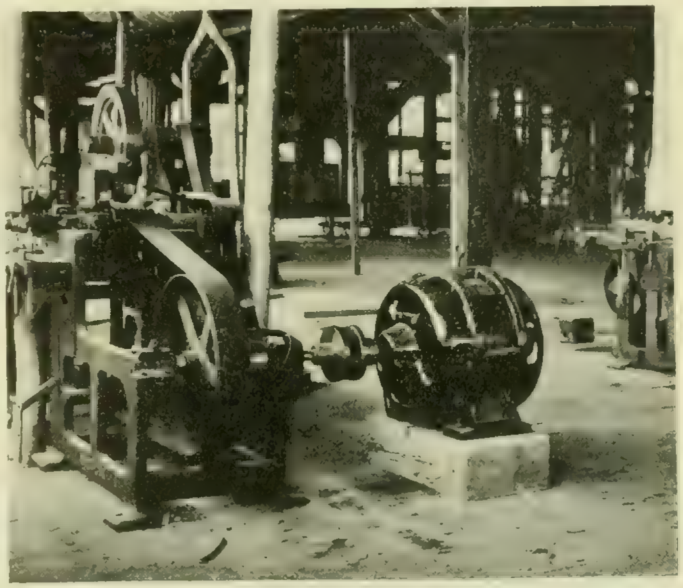


High Speed Matcher with 50 h.p. Direct Connected Motor

wheels keyed to the ends of a 60 h.p. motor shaft, takes care of the planing mill, every saw and planer head being connected and sufficient sweeps being provided for the floors.

(12) The dust from the separator drops down into the suction pipe of an 80-inch single Sturtevant fan with the wheel keyed to the shaft of a 60 h.p. motor.

The generator set at present consists of a 500 kw. turbo-generator of the Allis-Chalmers-Parsons make, a 27½ kw. engine-driven exciter, and a 10 kw. motor-driven exciter. The engine-driven exciter is also used to light the sawmill and buildings adjacent to it. A slate switchboard holds a complete set of instruments and a Tyrrell volt regulator. The system used is 3-phase, 60 cycle, alternating current, 440 volts. The generator is a 480 volt machine. Another 500 kw. set will be installed, so that ample power will be available for additions to the factory plant. Two main circuits lead from the switchboard, one to a distributing room in the basement of the mill and the other 600 feet



Doors Stickers with Direct Electric Drive, J. Hanbury & Co.

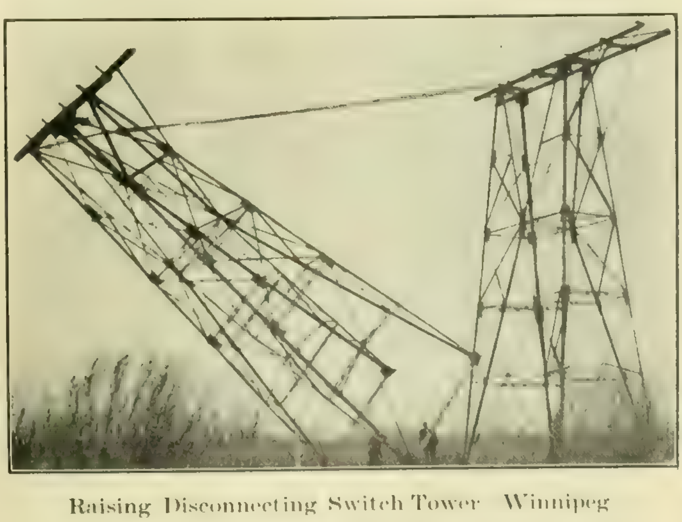
to another distribution room in the planing mill. The cables are led to heavy copper bus bars and taken through fuses to the different motors. The wiring is all in conduit.

The Allis-Chalmers-Bullock Company supplied practically all the motors, there being 45 motors, with a total horse power of 1,355½. The Waterous Engine Works Company supplied the boilers and induced draft system, also the filing room equipment. Mather & Yuill Company, electrical engineers, of Vancouver, B.C., attended to all the electrical installations.

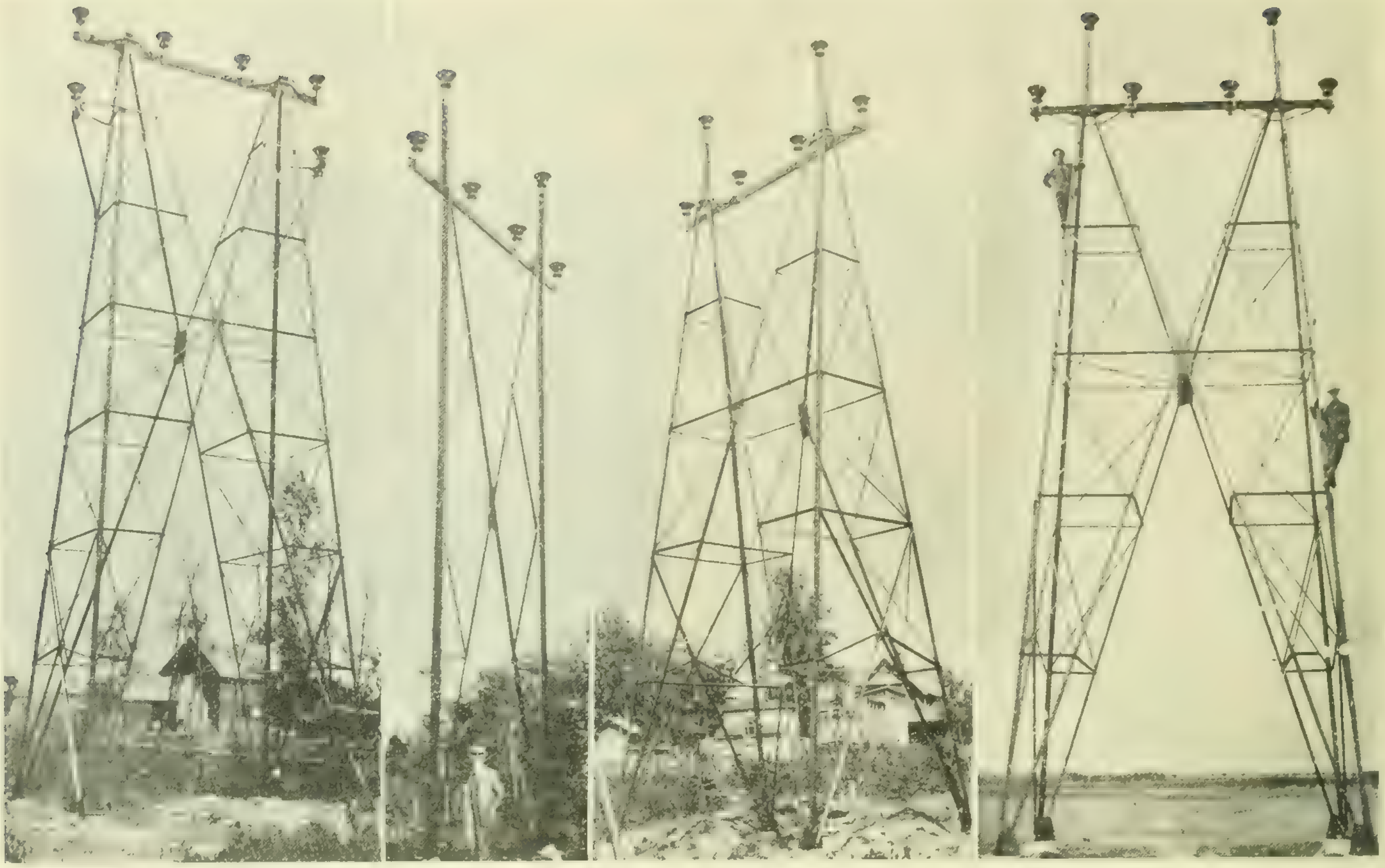
Winnipeg Municipal Towers

The accompanying photographs are typical of the towers being used by the Winnipeg municipal system on their line from Point du Bois to Winnipeg. The types of towers are classed as braced, flexible, flexible muskeg, transposition, angle, special angle, disconnecting switch, dead ending, special high, river crossing and railway crossing.

The figures in connection with these towers are as follows: braced, weight 3,882 pounds, height 50 feet; flexible, 1,870 pounds, 42 feet; flexible muskeg, 2,228 pounds, 42



Raising Disconnecting Switch Tower Winnipeg



Typical Winnipeg Towers. (1) Transportation. (2) Flexible. (3 and 4) Standard Braced

feet; transposition, 4,248 pounds, 50 feet; disconnecting, 16,000 pounds, 56 feet; dead ending, 9,000 pounds; angle towers, 6,628 pounds, 56 feet.

The size of the members in the various towers is as follows: braced towers, 4 x 4 x 1/4 angles in main legs, 1 x 1/8 straps, 4-inch cross channel in head. Flexible towers, 6-inch channel in main legs, 1 x 1 angles for tension members. Flexible muskeg, as in flexible tower, but with 6-inch channel across feet to allow good bearing on concrete caps. Insulator pins, six 2-inch pipe pins per tower, each 18 inches long, bolted on with U bolts. Anchor bolts 24-in. x 1-in. or 24-in. x 1¼-in.

(1) Railway Crossing. (2) River Crossing at Terminal Station

The line is approximately 77 miles long, passes over rock, muskeg, sand, quicksand and prairie. In solid ground concrete piers 7 ft. 6 in. high were built; in muskeg piles were driven and a concrete cap was built on top; in quicksand cribbing was used.

The braced towers are 1,200 feet apart with flexible or flexible muskeg tower between each pair of braced towers, except on rocks where it was advisable to erect a line of braced towers. The greatest span is 939 feet, the shortest 400 feet, the average 600 feet. The total number of towers is 694.

These photographs were furnished through the kindness of Mr. H. C. Lott, special inspector for Smith, Kerry & Chace, consulting engineers.

What is said to be the largest telephone contract ever taken, has just been signed by Mr. Frank M. Andrews, president of the new McAlpin Hotel, which will be located on Broadway and 34th street, New York city. The contract covers 100 trunk lines, 1,800 stations and 500,000 local messages at an annual value of $28,334 for services. A supplemental contract provides for a charge of $2,250, covering the installation of 16 telautograph instruments which will be located at various points of the hotel, in addition to the 16 regular operating positions of the switchboard. In addition to the main switchboard there will be three sub-switchboards; one 2-position switchboard to be used for pay station purposes in connection with 17 booths to be located in the main corridor of the hotel; one in the engineering department to serve about 16 stations and another in the general office of the hotel, to take care of about 12 extension stations for the use of the hotel management.

Winnipeg Railway Company's Standard City Car

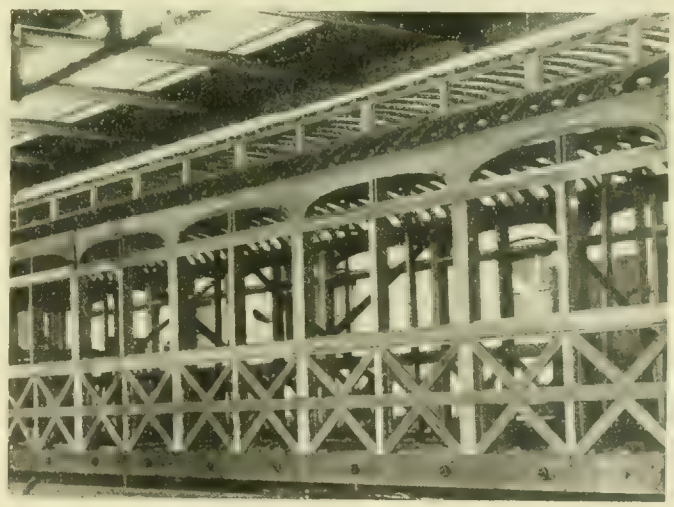
Car Shops of the Winnipeg Railway Co.

All the cars used by the Winnipeg Electric Railway and by the Winnipeg, Selkirk, and Lake Winnipeg Electric Railway are built in the company's own shops on Pembina street. These shops comprise a complete wood-working plant, with an up-to-date set of planers, saws and other wood-working tools, a large assembly floor where the wood-work of the cars is assembled, and a paint shop where all the painting is done. When the wood work of the cars is complete they are sent to the car barns on Main street on a pair of shop trucks, and they are then equipped with their standard trucks, motors and other electrical equipment. The car barns are well fitted for this work and the general repair work on the cars, having a small but well-equipped machine shop and a good blacksmith shop. The repair pits are very well designed for their work and the building is particularly well lighted and heated. A hot air heating system is used in which the cold air is drawn between a series of steam pipes, filled with exhaust steam from the company's steam power plant near by, and forced into the distributing mains by a large blower.

C. R. Ross, Chief Elec. Engineer, Winnipeg St. Ry. Co.

The standard car for use in the city is forty feet in length over all, is provided with seats running the length of the car, and will seat forty-four comfortably with a maximum load of seventy-five. These cars have the large rear platform so that they can readily be converted into pay-as-you-enter cars.

The cars are particularly well built, the older ones having an I-beam and timber underframing while the newer ones are entirely of steel. The trucks being placed under the cars at present are the Baldwin type 5418-E. Each car is equipped with four G.E. 80 motors, G.E. K6 controller and Westinghouse automatic air brakes with air sanders. The greater number of the cars are provided with electrical heaters at present, but a winter's test of the Peter Smith hot air heaters has resulted so satisfactorily, that the new cars will be equipped with these heaters. The cars are finished in the natural cherry and make a very pleasing appearance.



Car-body Under Construction.

The shops have a normal output of thirty cars per year, but this can easily be increased to fifty without enlarging the buildings.

There are at present 230 cars in service, exclusive of trailers, of which there are twenty. Of these 150 are of

Standard Car Used on the W. S. & L. W. Railway.

Mr. Geo. Garrett

the large type as shown in the accompanying illustration.

The cars for the Winnipeg, Selkirk, and Lake Winnipeg Railway are fifty-eight feet long over all and have a four motor equipment of G. E. 73, seventy-five horsepower motors with unit switch group control and with G. E. air brakes. These cars have seating capacity for sixty-four people, and will give a speed of fifty miles an hour. The trip from Winnipeg to Selkirk, a distance of 22 miles, has been made in 27 minutes. There are six of these cars in service and three more under construction.

Accompanying illustrations show an exterior and an interior of one of these cars and one in process of construction. On the interior view is shown, seated at the left, Mr. Phillips, the general manager of the Winnipeg Electric Railway, and on the right, Mr. Garrett, the master mechanic.

Mr. Geo. Garrett, whose photograph is shown herewith, has charge as master mechanic of the car shops, and of the equipment and repair of the rolling stock of the entire street railway system, and the excellent condition of this equipment bears witness to the quality of the work done.

Montreal's Underground Conduits

After years of agitation it would appear that the projected conduit system for electric wires in the city of Montreal is within measurable distance of realization. The appointment within the past few days of three commissioners, all of whom are expert engineers, may be said to mark one of the final stages in an important undertaking which has been very slow in maturing. The commissioners will be Mr. R. S. Kelsch, consulting hydraulic and electrical engineer, representing various electrical companies operating in Montreal; Mr. Beaudry Leman, C.E., B.Sc., manager of the Canadian General Development Company, Limited, representing the City of Montreal; and Prof. Louis A. Herdt, of McGill University, appointed by the Quebec Public Utilities Commission. It will probably be a few weeks yet before the commission will commence work on this big undertaking and it will be a year or two, in all probability, before the plans will be far enough advanced for the first tender to be called for.

First of all a general scheme embracing an underground tunnel system for the whole city of Montreal will have to be outlined, then certain areas or districts will have to be defined in which to commence the excavation and installation. The whole plan comprises the arrangement of sufficient ducts for the accommodation of over twenty companies that will be required to use conduit space.

A circumstance which will tend to complicate matters even more is that already there are many miles of conduit in some of the principal streets constructed by operating companies such as the Montreal Light, Heat & Power Company, the telephone companies, the telegraph companies, and others. These will have to be taken into consideration in connection with the new work and in some cases will no doubt become incorporated in the new system.

The subject of underground conduits was taken up seriously first of all by the city council, which appointed a committee to make a study of the whole question and report. The committee reported that the scheme was both feasible and urgent and recommended the appointment of a commission of experts to assist them in arriving at some adequate idea of the cost of the undertaking. Such a committee was appointed in 1908 and consisted of Messrs. P. W. St. George, Robert A. Ross and Beaudry Leman. These engineers after careful study gathered a large volume of important information regarding the work involved and assisted very materially in framing the amendment which became incorporated in the city charter in the following spring.

All Wires Underground

By an amendment to the charter of the City of Montreal, assented to at Quebec on May 29th, 1909, the city of Montreal was authorized to construct, administer and maintain, and also to regulate the use of a system of underground conduits in which should be placed all telegraph, telephone, electric light and power wires, street railway feeder and other lines (exclusive of trolley wires) as well as cables and transmission lines belonging to any person or corporation having privileges in or on the public streets, lanes, squares, or other places. Such conduits are to be of


Professor Herdt.


Mr. R. S. Kelsch.


Mr. Beaudry Leman.

sufficient size and capacity to provide to a reasonable extent for all future requirements. This section shall not be interpreted as allowing the city to administer the installations or systems of the various companies.

Authority was given to the council to compel persons or companies owning or operating overhead wires or cables to remove such from the streets and only suitable conductors shall be installed in the underground conduit system in a manner specified by the council.

Separate openings or separate compartments in the openings shall be given to each company or person using these conduits when asked for provided the same is practicable. A permanent wall of brick or other non-conducting material shall separate completely that part of the conduits in which electric light or power wires are placed from that part in which telegraph, telephone or signal wires are carried and the entrance to each part of the conduit shall be by separate manholes.

It was enacted that after the commencement of the construction of this conduit system in any street or circuit no company should have the right to set up poles or string wires or cables or to construct underground conduits in such streets or circuits, and even the city council would have no authority to grant any such rights to anyone excepting for trolley poles, street lamp poles and such distribution poles as may be found necessary by the city.

Compensation by Arbitration

As the removal of poles and wires already installed in the streets would entail heavy loss to the operating companies the city was authorized to compensate the owners of the same on a basis of the actual value at the time the materials are removed, the amount of compensation to be determined by three competent arbitrators. After such compensation has been paid the material expropriated shall become the absolute property of the city and the material shall be removed from the street.

When the city decides to place the electric service underground in any street, square or other place, the conduits already placed in those streets by operating companies shall be taken over by it. Reasonable compensation shall be paid for such conduits, cables and other appurtenances thus rendered useless.

The amount of compensation in any case shall be determined by the provisions of the revised statutes governing expropriations by railway companies. When the city notifies the persons or companies interested of its intention to construct conduits in any portion of the city it shall file its application with a judge of the Superior Court for the appointment of arbitrators. The arbitrators shall hear the interested parties and give their award within four months from the date of their appointment unless such delay be extended by the arbitrator. The decision of the majority of the arbitrators shall be final and binding upon the city, and all other parties interested.

The city was authorized to determine the method of connecting the main trunk lines with the distributing lines and of making the service connection. It may construct, maintain and administer distributing ducts, charging a rental therefor, or allow persons or corporations interested to install their own distributing ducts under the city's supervision or with the approval of the council and may delegate to them in certain instances the powers granted to it by this or previous enactments.

Companies Will Pay Rental

The city was authorized to fix and receive rentals on all underground constructions reserved by the persons or companies operating the same previous to expropriation as well as on its own conduits with which the expropriated conduits will become incorporated. Such rentals shall be fixed from year to year to cover the cost of maintenance and administration as well as interest and sinking fund sufficient to extinguish the debt in forty years. The expenses chargeable to this account shall include the salaries and expenses of the electrical commission. After the full cost of the undertaking shall have been paid off the rentals shall be for administrative purposes only and shall be levied upon each party using the conduits in proportion to the portion occupied severally by them. Tenders shall be called for the construction of these conduits.

The city was authorized to enter in and upon any private property as well as the public streets in carrying out the improvements contemplated, proper compensation being given for any real damage caused in consequence of the work.

The Duties of the Commission

In order to provide funds for the carrying out of this undertaking the city council was authorized to issue bonds, debentures or inscribe stock to the amount of $5,000,000. Further, for the carrying out of this undertaking the city was authorized to pass a by-law providing for the ap-

pointment of a commission to be known as the Electrical Commission of the City of Montreal. The duties of this commission include the drawing up of the rules and regulations respecting the use, maintenance and management of the conduits as well as the preparation of complete plans and specifications of the same. It was decided that one commissioner should be appointed by the city of Montreal, another by the operating companies and the third by the Quebec Public Utilities Commission.

As soon as the plans, specifications and regulations above mentioned shall have been approved by the Public Utilities Commission, and the contracts shall have been given out by the city of Montreal, the city shall, with the approval of the Public Utilities Commission, appoint a competent engineer, who, alone, shall have the direction and supervision of the construction and maintenance of the conduits; as soon as such appointment is made the duties of the three members composing the Electrical Commission shall terminate, and the new engineer so ap-

Interior Standard Winnipeg Car

pointed shall constitute the commission. None of the engineers shall be dismissed except by the Public Utilities Commission after hearing the interested parties and vacancies occurring on the commission shall be filled in the same manner as the appointment first made.

The Interested Companies

The various companies interested number twenty-six, and are as follows: The Dominion Guarantee Company, Limited; the Great North Western Telegraph Company; the Merchants Telephone Company; Montreal Electric Light Company; the Merchants Light, Heat & Power Company; Federal Telephone Company, Limited; the North American Telegraph Company, Limited; the Montreal Light, Heat & Power Company; the Provincial Light & Power Company; the Lachine Rapids, Hydraulic & Land Company; the Temple Electric Company; the Imperial Electric Light Company; the Royal Electric Company; the Citizens Light & Power Company; the Standard Light & Power Company; the Montreal & St. Lawrence Light & Power Company; the Montreal Gas Company; the Dominion Light, Heat & Power Company; the Canadian Light & Power Company; the Central Heat, Light & Power Company; the Bell Telephone of Canada; the Public Service Corporation; the Montreal Park & Island Railway; the Montreal Street Railway Company; the Montreal Terminal Railway; Canadian Pacific Railway Telegraph Company.

Personals

Mr. A. E. Starr has been appointed manager of the Victoria office of the C. P. R. telegraph system.

Mr. William Christie, for twenty years manager of the Victoria, B.C., office of the C. P. R. telegraph system, has resigned.

Mr. F. R. Dark has resigned from the employ of the City of London, but will remain in London and open an electrical supply business on his own account.

Mr. Chas. T. Mitchell, of the Reliance Electrical Manufacturing Company, Limited, of Winnipeg, is at present on a business tour west, as far as Saskatoon.

Mr. F. R. Pendleton, formerly with the Holophane Glass Company, has joined the sales staff of the Packard Electric Company, and will make his headquarters at Toronto.

Mr. A. L. Woolf, special representative Canadian Tungsten Lamp Company, has left for Vancouver and the various cities of the west.

Mr. T. W. Turner has resigned the managership of the Moose Jaw telephone office and will go into business for himself. He is succeeded by Mr. W. H. Warren.

Mr. Geo. C. Rough, Sales Manager of the Packard Electric Company, has recently returned from a trip to the Pacific coast and reports business to be in a very lively condition all through the west. Mr. Rough states that he has eliminated the word "boom" from his vocabulary as far as the west is concerned. There is no boom there, he says, but just the natural rapid and lasting growth of the finest country in the world.

Mr. R. S. Kelsch has been retained by the Dominion Textile Company to look after their interests in connection with the new power plant to be built jointly by the town of Magog and the Dominion Textile Company. This plant will be used for supplying light and power to the town and all surplus power will be consumed at the Dominion Textile Company's Cotton Mills, Magog. Messrs. T. Pringle & Son represent the town of Magog.

Mr. Charles Johns, former manager of the St. Thomas street railway, and since that time electrical and mechanical superintendent of the London & Lake Erie Transportation Company, has been appointed to the position of operator in charge of the St. Thomas power and light distribution station. Mr. Johns will have complete charge of the local plant, and will also be required to advise at any time on electrical matters pertaining to the street railway.

New Books

Motors, Secondary Batteries, Measuring Instruments & Switchgear—by S. Kenneth Broadfoot, A.M.I.E.E.,—one of the Electrical Installation Manuals series being published by Constable & Company, London, England. This book will be found of value to central station men and operating engineers who require condensed information on varied operating conditions.

Arc Lamps and Accessory Apparatus—by J. H. Johnson, A.M.I.E.E.—one of the electrical installation manuals published by Constable & Company, London, England. A primer written with the idea of enabling electrical contractors, wiremen and engineers in general to decide upon the correct type of arc lamp to adopt under given condition. Various types of lamps and accessories representative of their respective classes are described.

Characteristics of Induction Motors

Their Operation, Construction, Application, and Characteristics—Read Before the C. S. C. E. by A. Miller Gray

The induction motor has come into very general use in this country, and is rapidly superseding the d.c. motor for many classes of work, yet its characteristics are not very well understood.

The theory of operation of the machine is briefly as follows: Figs. 1 and 2 show the essential parts of a 2-phase induction motor. P is called the stator, and it carries two windings, M and N, arranged 90 deg. apart. These windings are connected to phases 1 and 2 respectively of a 2-phase alternator. The value of the current which flows at any instant in coils M and N is got from Fig. 3; thus at instant A, Fig. 3, the current in phase 1 = Imax, and in phase 2, at the same instant, = O.

The magnetic field produced in the machine at the various instants A, B, C, D, E, Fig. 3, is shown in Fig. 4, and it will be seen that, although the winding is stationary, yet a revolving field is produced, which field moves through the distance of two poles when the current passes through one cycle; so, in general,

$$\text{r.p.m. of field} = \frac{\text{cycles per. sec.} \times 60}{\tfrac{1}{2}\text{ the number of poles}}.$$

This speed is called the synchronous speed.

The sole purpose of the stator is to produce this revolving magnetic field. Fig. 5 shows an actual stator. The winding is arranged in belts just as in Fig. 1, but the ends of the coils are bent back so that the rotating part can readily be placed in position. This rotating part is called the rotor, and it is put into the revolving field.

The most common type of rotor is the squirrel cage rotor. It consists of an iron core carrying copper rods in slots. These rods are joined together at the ends by brass end connectors.

When this rotor is put into the revolving field, currents will be set up in the rotor conductors, and a torque will be produced in such a direction as to make the rotor follow up the stator field. At standstill this current is large, being about 5½ times full load current, but, unfortunately, it lags behind the magnetic field which produces it, so that when the magnetic field is a maximum at any point on the rotor periphery, the current in the rotor conductor at that point has not yet reached its maximum value, and so the torque produced with 5½ times full load current is only about 1½ times full load torque.

To increase this torque at standstill, called the starting torque, the current must be brought more in phase with the magnetic field. This is done by increasing the resistance of the rotor. As this resistance is increased the current is decreased, but the starting torque is increased, because the current is now more in phase with the magnetic field. When the motor is running, a large rotor resistance is undesirable, because it causes a large rotor loss and therefore a low efficiency. So the wound rotor type of induction motor was developed. This type of motor has a large resistance in the rotor at starting and a low resistance when running. The winding is left open at three points which are connected to slip rings. The winding is closed outside of the machine through resistances which can be adjusted, and finally short circuited when the motor is up to speed.

When a motor is not carrying any load, it runs at practically the same speed as the revolving field. As the load increases the rotor slows down slightly, thereby allowing the rotor bars to cut the lines of force of the revolving field, whereby emfs. are induced and current caused to flow in the rotor bars. This current produces a torque. So

THE INDUCTION MOTOR

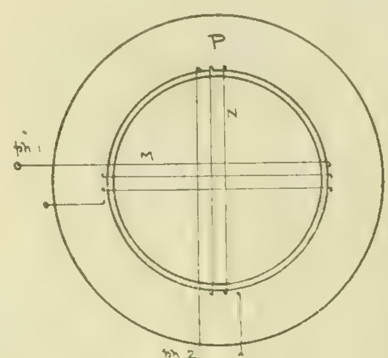


FIG-1

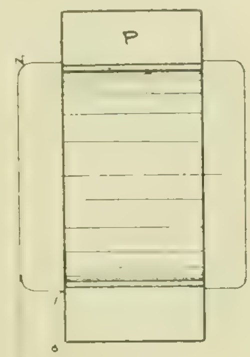


FIG-2

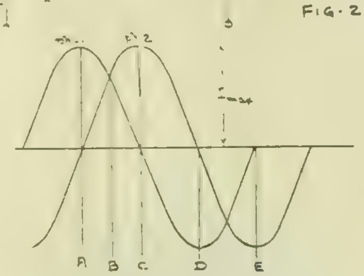


FIG-3

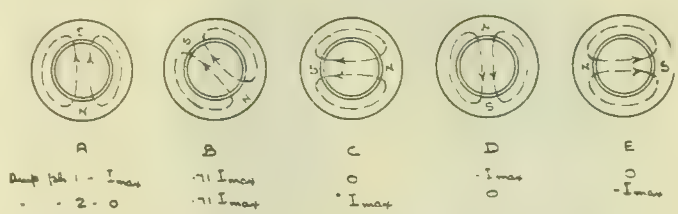


FIG 4

to carry any load, the rotor of an induction motor must slip through the field and the ratio

$$\frac{\text{r.p.m. of field—r.p.m. of rotor}}{\text{r.p.m. of field}}$$

is called the % slip; for the average motor this value is about 5% when the motor is carrying full load, and it varies directly as the load varies from no load up to 25% overload.

The characteristics of a standard squirrel cage, a high resistance squirrel cage, and a wound rotor motor are given in the following table:

TABLE I.

	Standard squirrel cage	High resist squirrel cage	Wound rotor
Efficiency ½ load	88 %	86.5%	87%
full "	88.5 %	85 %	89%
1½ " .	85.5 %	81.5 %	86.5%
Power factor ½ load .	78 %	78 %	78%
full " ..	89 %	89 %	89%
1½ "	90 %	90 %	89.5%
Max. torque..........	3.16 full load	3.16 full load	2.7 full load
Starting torque..... .	1.76 " "	2.35 " "	full load
Starting current	5.8 " "	5.4 " "	full load
Speed at full load	870 R.P.M.	835 R.P.M.	870
Temperature rise at full load... ..	22°c.	28°c.	25°c.

Selection of Type of Motor.—From these results it is possible to state in a general way for what class of service each type is suited.

The standard squirrel cage motor is used when the starting torque is not greater than full load torque, the time taken to get up to full speed not longer than 30 seconds, and the large starting current at low power factor not objectionable. The high resistance squirrel cage type is used for heavier starting duty than the above, and in places where the extreme simplicity of the squirrel cage makes that type desirable; for example, in cement mills.

The wound rotor type is used for very heavy starting duty, for variable speed duty, and in places where the starting current must be kept down to a reasonable value.

It is desirable to use the squirrel cage type of motor wherever possible on account of the simplicity of its construction and the absence of sliding contacts. The principal objection to this type of motor is the large starting current which it takes.

Starting on Reduced Voltage.—Consider the case of a squirrel cage motor which takes 5½ times full load current to give 1½ times full load torque at starting. If the voltage applied to the motor terminals is reduced to 82% of the voltage of the system by means of a transformer, then the starting current in the motor will be 82% of 5½ or 4½ times full load current, and the starting current in the line, on account of the transformer, is 82% of 4½ times or 3.7 times full load current.

The starting torque will be reduced to 82% on account of the reduction of the motor current, and again to 82% on account of the reduction of the magnetic field, since the

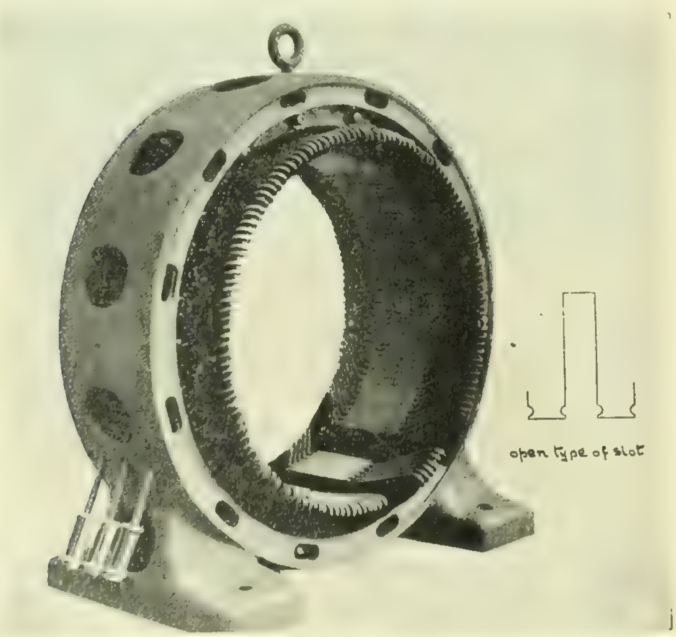


Fig. 5 Induction Motor Stator

strength of the magnetic field is proportional to the voltage, so the starting torque will be 82 of .82 of 1½, or full load torque.

It will readily be seen that if the motor starts up light, as, for example, where a fast and loose pulley is used, the starting voltage can be still further reduced. Thus, if the required starting torque is only 30% of full load torque, the starting voltage will be 45% of the line voltage; the starting current in the motor will be 2½ times full load current, and the starting current in the line 1.1 times full load current.

It is possible in many ways to so modify the drive that the torque at starting is less than full load torque; thus, mention has already been made of the use of fast and loose pulleys. Friction clutches come under the same head.

Air compressors are usually started up light by supplying the compressor with a bye-pass, which connects the two ends of the compressor together through a pipe. When the compressor is up to speed, a valve in this pipe is closed,

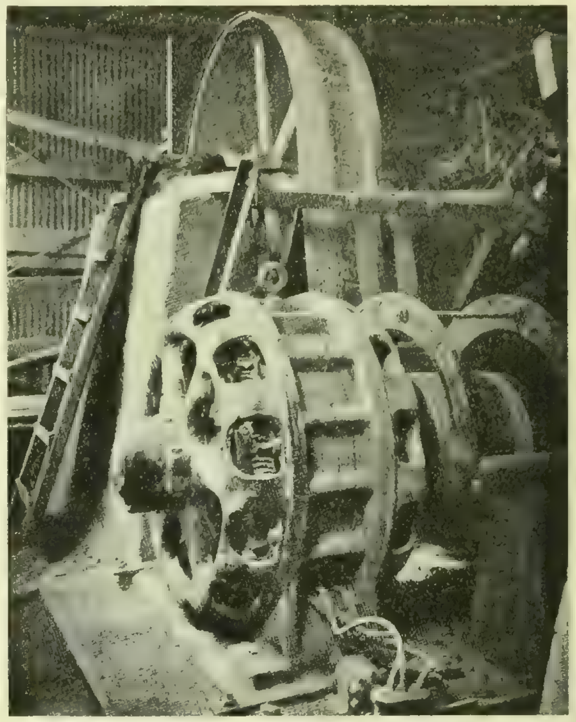


Fig. 6—Tube Mill Drive, showing Friction Clutch

and the compressor then delivers compressed air to the air system. Plunger pumps can be readily started in the same way.

There are certain classes of work, however, where the extra complication of fast and loose pulleys or friction clutches will not be considered, where the starting torque is large, and yet where the user will not consider the wound rotor type of motor. This class of work is represented by the cement mill drive. A cement mill operates 24 hours a day, and reliability is essential in the whole train of operations.

Fig. 6 shows a short centre drive to a tube mill; in this case the mill is started through a friction clutch. The cut shows the amount of dust that is lying around in spite of the fact that the motors are in a special room and drive through the wall.

Another case is a battery of tube mills operated by squirrel cage motors having high resistance and connectors. These tube mills start up half full of pebbles, and the initial torque required before this mass of pebbles begins to roll is very large. The comparatively large starting torque got by using the high resistance end rings, is got at a sacrifice of efficiency and an increase in the temperature rise of the machine, as shown in Table I.

Largest Squirrel Cage Motor that can be Used on a System.—The large starting current taken by a squirrel cage induction motor at starting, limits the size of motor that can be run on a given system. It can readily be seen that it is impossible to start a 200 h.p. motor which has a starting current of 5½ times full load current, from a 200 kilowatt alternator which can only give 3 times full load current on short circuit.

Consider the following proposition: The normal load on the alternator is A amp. at 80% power factor, the largest squirrel cage motor on the system takes B amp. at 80%

power factor when on full load, and $3\frac{1}{2}$ B amp. at 40% power factor on starting.

Fig. 7 shows the relation between the ratio A/B and % voltage drop on the alternator, the alternator rheostat being fixed. Under these conditions the normal current of the motor should not exceed 5% of the normal current rating of the alternator. Most alternators are now supplied with automatic regulators if operating on a large

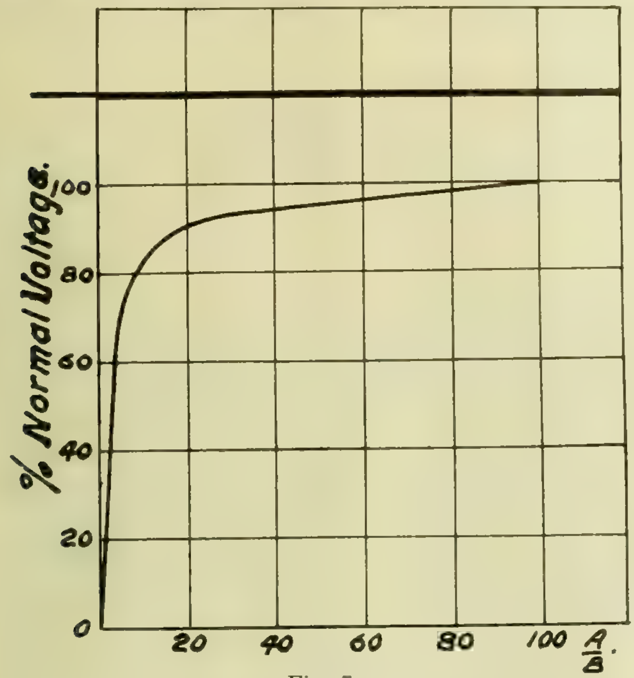


Fig. 7

motor load. The regulators vary the excitation as the load varies so as to keep the terminal voltage of the alternator constant, up to the point where there is full excitation on the alternator. Curve 8 shows the maximum current at different power factors which can be handled by such a regulator, without any drop in generator voltage. With the amount of field margin shown in Fig. 8, the maximum permissible ratio of B/A is 30%.

Variable Speed Operation of Induction Motors.—For variable speed service there is no choice of type of motor, the wound rotor motor must be used. The squirrel cage motor is essentially a constant speed motor. The speed of a wound rotor motor can be reduced by increasing the rotor resistance, because if the rotor resistance is increased, a greater voltage will be necessary to send a given current through the rotor, and a greater slip will be necessary to give this voltage.

One objection to this method of speed variation is that the speed varies greatly with the load, being synchronous speed at no load, and varying from that to full load speed at full load, so if the full load speed were low, and the motor were driving, say, a lathe, and the lathe was being used to turn up a rough piece of material, the speed would see-saw up and down depending on the depth of the cut. Such a state of affairs would not be satisfactory, so it may be said that the induction motor should not be used for variable speed work unless the load is constant.

Another serious objection to the use of a wound rotor motor on variable speed work is, that when operating at reduced speeds, the amount of power wasted in the resistance is large; in fact the power lost in the secondary resistance = the output of the motor

$$\times \frac{\text{the speed at no load} - \text{the actual speed}}{\text{the speed at no load}} = \text{the output of}$$

the motor × % slip.

If a large part of the load is such as to require a variable speed drive, the induction motor is not to be recommended. If only a small part of the total load requires a variable speed drive, it will possibly be best to install a motor generator set, and handle that part of the load by means of direct current motors.

Construction of Induction Motors.—The simplicity of the construction of induction motors has already been pointed out; but there are one or two points to which special attention must be drawn.

Open and Closed Slots.—There are two types of slots used in induction motors; these are shown in Figs. 5 and 9, and are called the open and closed slot, respectively.

The closed slot is used on all rotors, because the rotor winding seldom breaks down, due to the fact that when the machine is running the voltage induced in the rotor is low, and then, again, the rotor winding is free from all surges.

Stator windings, on the other hand, have much higher voltages between turns, between phases and to ground, so the stator winding is more liable to break down; ease of repair, then, is very essential in the stator winding.

Figs. 5 and 9 show the two types of windings corresponding to the two types of slots, and it will be noticed that the closed slot winding is much more difficult to repair, and so is not greatly used in this country. In the case of the open slot winding, any coil which becomes damaged can be readily removed and replaced by a new one without seriously disturbing the rest of the winding. The closed slot construction is not to be recommended for stators of motors having a larger output than $7\frac{1}{2}$ h.p., except in the special case of very slow speed machines, where the closed slot construction is necessary in order to get reasonably good characteristics. Below $7\frac{1}{2}$ h.p., competition has made it necessary to use the closed slot construc-

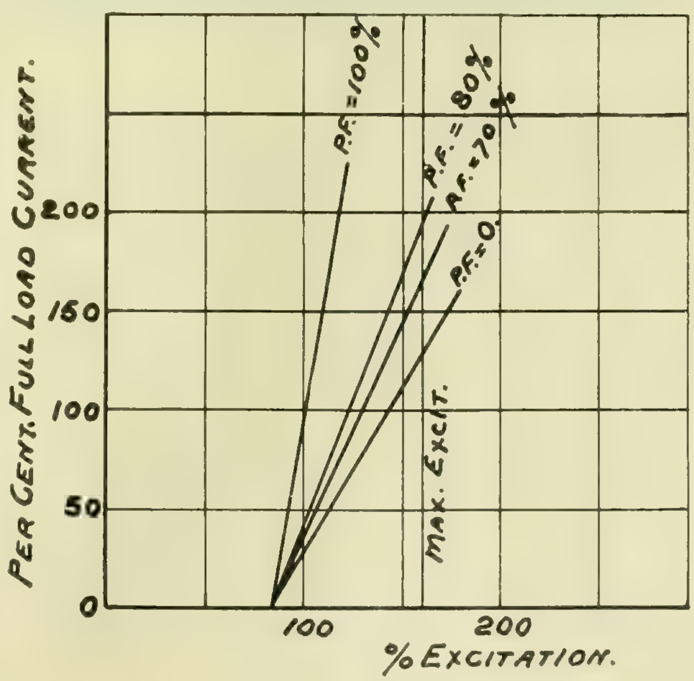


Fig. 8

tion because it is cheaper, since it allows the use of a smaller machine to give the same rating and characteristics.

The Length of Air Gap.—One of the weakest spots of an induction motor is the air gap, which is very small. Theoretically, the smaller the air gap the better the characteristics of the machine. The air gap is therefore fixed by mechanical limitations, and is made as small as possible. The values used in practice are given by the following formula:

Length of air gap in inches = $aD + bL + cV + d$ where
$a = .00035$, $b = .001$, $c = .003$, $d = .005$
D = rotor diameter in inches.
L = length of iron in the core, parallel to the shaft in inches.
V = peripheral velocity of the rotor in 1,000's of feet per minute.

To take a particular example: A 200 h.p. motor running at 600 r.p.m. will have a rotor diameter of about 34-

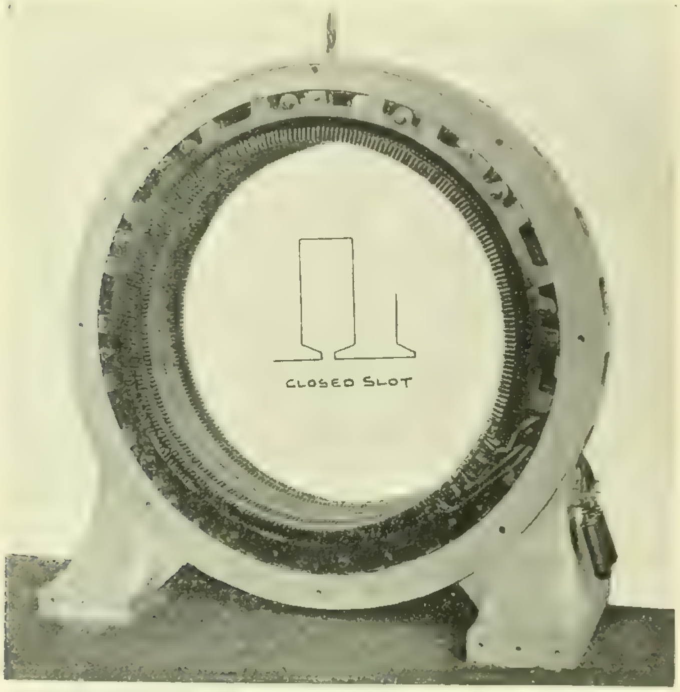


Fig. 9

in., a core length of 8-in., and a peripheral velocity of 5,350 ft. per minute. The air gap will therefore be .042 in. By the air gap is meant the difference between the radius of the stator outside and the rotor inside surfaces, and not, as is sometimes given, the difference between the diameters.

The air gap can be increased in length at the expense of the power factor of the machine. Thus, the 200 h.p. motor mentioned above has, with an air gap of .042 in., a magnetizing current of about 30% of full load current, and a power factor at full load of about 90 %, and at half load of about 80%. If the air gap is increased to .06 in., the power factor will be about 85% at full load and about 65% at half load.

In cement mill, woolen mill, and other such work, the motors are always running on full load, and to the cement manufacturer the gain of 50% in air gap length is often considered to be worth more than the loss of 5% in power factor, because the motors will then stand a greater amount of wear in the bearings and will be easier to blow out. There have been cases in cement and woolen mills where the air gap space has become so filled up with foreign matter as to stall the motor.

The use of a closed slot construction in the stator allows the use of a slightly larger air gap for the same power factor than does the open slot machine, but at the sacrifice of ease and repair.

Connection of the Motor to the Load.—When the motor is geared to the driven machine, a flexible coupling should be put between the motor and the load whenever possible, otherwise excessive vibration is liable to destroy the insulation; and again, since the clearance between the rotor and stator is so very small, the pounding of the gears would soon wear down the bearings by the amount of the air gap clearance and new bearings would then be required.

When a flexible coupling cannot be used on account of the cost or because the space is not available, an outboard bearing should always be supplied on motors above 20 h.p., and for motors below that size, when no outboard bearing is used, the driving pinion should be of raw hide.

Fig. 10 shows a machine with an outboard bearing. It also shows what is just as important in such cases, namely, split housings.

Use of Split Housings.—When motors have gears or couplings keyed on to the shaft, it is a difficult matter to remove these from the shaft at any time, and it is particularly difficult to remove them with a housing in the way. If the housing is solid, no new bushings can be inserted until the gear or coupling is removed. In such cases split housings and bushings as shown in Fig. 10 are to be recommended, and the customer ought to be willing to pay the extra price for them.

Appearance and Finish of the Machine.—It is not generally recognized that appearance and operation of a motor are intimately connected with one another. While it is true that a well finished motor, with the castings clean, well filled and rubbed down, and the lines of the machine attractive in appearance, may not run any better than a very ordinary looking machine which has just got a coat of paint on the top of the rough casting, yet it will be found that the man in charge always pays more attention to the handsome machine, which, on that account, is liable to give less trouble, require less for repairs, and give greater satisfaction than the poorer looking machine.

Heating and Temperature Guarantees.—The most important limit of output of an electrical machine is that at which the insulation begins to deteriorate due to heat. With present practice in insulating the temperature of the stator coils of any motor, or the rotor coils of a wound rotor motor, should never exceed 85 deg. cent. Tape begins to char at 120 deg. cent., while both tape and paper become very brittle much below this temperature and pulverize rapidly if there is much vibration in the machine.

Squirrel cage rotors, at starting, often exceed this value of 85 deg. cent., because it can be shown that the loss in the rotor at starting = the full load output of the machine

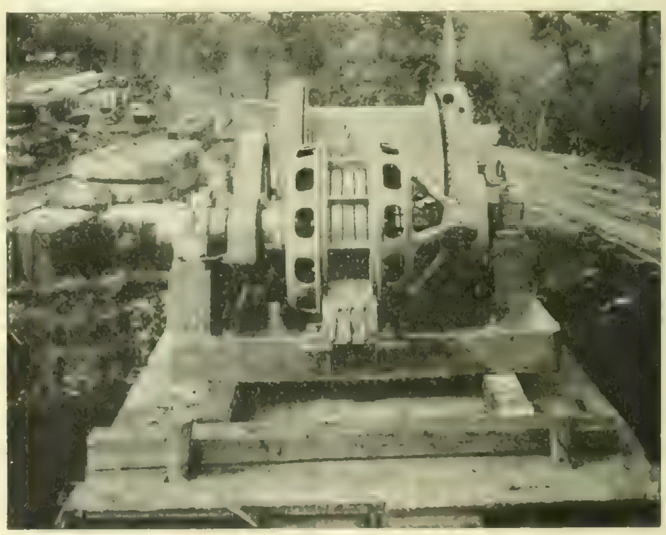


Fig. 10

× % of full load torque required at starting. Thus, if a 20 h.p. motor starts up against full load torque, 20 h.p. must be absorbed by the rotor copper at starting. This 20 h.p. being dissipated in heat, will raise the temperature of the rotor

bars and end connectors rapidly, unless they have a large body to absorb the heat. For ordinary starting duty .6 lbs. of rotor copper per horse power dissipated has been found sufficient, provided the time required to accelerate the load to full speed does not exceed 30 seconds. When the time for accelerating the load is longer than this, the heavier rotor end connectors will be necessary, and in some cases a wound rotor must be used, in which case the loss at starting is dissipated in a resistance external to the machine.

Fig. 11 shows an extreme case of a fly-wheel motor generator set used to supply direct current to two unloading coal barges. The load on the d.c. end is 65 h.p. average, with a maximum peak load of 400 h.p. The motor is a 75 h.p. squirrel cage motor, and the fly-wheel weighed 3½ tons. The squirrel cage rotor had a high resistance, so that the speed dropped rapidly as the load increased and allowed the fly-wheel to carry most of the peak load. The set had a speed of 840 r.p.m. on the average load of 65 h.p., and took 5 minutes to come up to full speed; but this is an extreme case, and was made possible by the use of a high resistance alloy for the end connectors, which allowed them to have a large cross section.

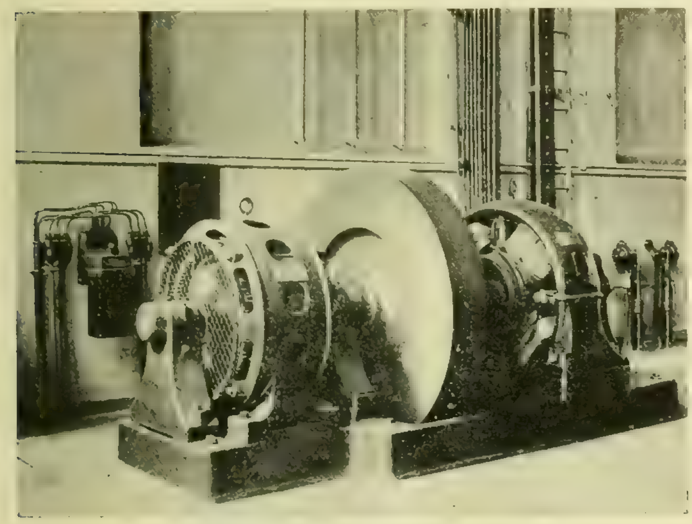


Fig. 11

Because of this rotor heating at starting, it should not be considered good practice to depend entirely on solder for connecting the rotor bars and rotor end connectors. A good mechanical joint should be made first and then solder should be used as an extra precaution.

The usual temperature guarantee is, that the motor shall operate for 24 hours at full load with a maximum temperature rise of less than 40 deg. cent. above an air temperature of 25 deg. cent. An overload of 25 % for 2 hours on the top of this shall not cause a temperature rise of more than 50 deg. cent. above the air. These guarantees are not consistent, because an induction motor is usually designed with such densities in the copper and iron that a motor will rise to its full temperature in about 2 hours, and the overload temperature will usually be 15 deg. cent. above the normal load temperature. To meet an overload guarantee of 50 deg. cent. rise for 2 hours overload, on the top of 24 hours normal load, requires normal load temperatures of 35 deg. cent. The designer would usually prefer to guarantee full load continuously 40 deg. cent. rise, and 25% overload continuously 55 deg. cent. rise.

Totally Enclosed Induction Motors.—There is, as a rule, little excuse for enclosing induction motors. If they are enclosed, their output for a given temperature rise is greatly reduced.

The following table gives some interesting figures on a liberally rated 30 h.p. motor.

Open motor	Same motor Housing Holes closed with perforated sheet metal ⅜" holes on ⅝ centres Yoke openings open	Same motor Housing holes closed with sheet metal Yoke openings open	Same motor Housing holes closed with sheet metal Yoke openings closed with cardboard	Parts of motor
18½°c. rise	22° cent. rise	46° cent. rise	74° cent. rise	Stator coils
18½	20	48	71	" laminations
15	21	46	71	Rotor cond.
14	21	44	71	" ring
14	20	41	69	" laminations
14	24	39	61	Oil in bearings
		25-30	52-57	Outside of yoke

As a rule the enclosed rating is about 30% of the open rating.

Forced Ventilation.—Some tests were made on an 80 h.p. 1,160 r.p.m. open type induction motor to find the effect of forced ventilation. When totally enclosed its output was 25 h.p. When 1,200 cubic feet of air per minute was blown through this enclosed motor it carried a load of 100 h.p. with the same rise of temperature.

Operation and Characteristics of Induction Motors.—Care should be taken in choosing induction motors to get them of the proper capacity. If they are too small they get hot and the insulation becomes impaired. If too large, so that they are only partially loaded, then the power factor of the whole system is greatly reduced. Table 1 shows how the power factor drops off at fractional loads.

The effect of varying voltage is shown in the following table:

TABLE 2.

	Full load Power Factor	Full load Efficiency	Start. Torque	Start. Currents	Max. Torque	Temp. Rise
20% increase in volt'ge	4% less	unchanged	40% inc.	20% inc.	40% inc.	unchanged
20% decrease in "	1% inc.	2% less	40% less	20% less	40% less	30% inc.

These figures are approximate.

The most important points to notice in the above table are the decrease in the starting and the pull out torques when running on reduced voltage. Reduced voltage is a very common occurrence.

Noise, its Location and Cure.—It is well known that of all electrical machinery the induction motor is the noisiest in operation. This noise may be due to three causes:

High speed motors are often noisy due to the whistling of air through the vent ducts. Induction motors are generally colled by air which is drawn into the machine by the rotor, and which passes through the stator and rotor vent ducts. The vent ducts make an excellent siren, because the current of air, passing through, is broken every time a rotor slot passes a stator tooth. This produces a musical note whose intensity depends mainly on the peripheral speed of the rotor. Noise due to this cause can be cured by blocking up the rotor vent ducts and then, if the motor gets hot, some other scheme of ventilation must be adopted.

The second cause of noise is the pulsation of the main field due to the change of reluctance of the magnetic circuit as the rotor revolves. Thus the flux in a stator tooth, due to the main magnetic field, is a maximum when a rotor tooth is opposite a stator tooth, and a minimum when a

rotor slot is opposite a stator tooth. With the partially closed rotor slots at present used in rotors this cause of noise is seldom met in practice.

The third cause of noise is the variation of the leakage flux as the rotor revolves. When a rotor tooth is opposite a stator slot, there is considerable leakage flux, which passes from one side of the stator tooth to the other by way of the rotor tooth. When a rotor slot is opposite a stator slot, this leakage flux is greatly reduced. Noise due to this cause, which is very common in over rated machines, increases with the load, because it is produced by the load current and not by the magnetizing current. This noise cannot readily be cured. It can be diminished somewhat by increasing the air gap, but this will, at the same time, increase the magnetizing current and lower the power factor.

The cause of the noise in any particular case can readily be determined. Run the motor on normal voltage and at no load. If noisy, it is due to causes 1 or 2. Now open the circuit, and if the motor is still noisy, it is due to cause 1. If the motor runs quietly on no load but is noisy when loaded, the noise is due to cause 3.

Characteristics of Induction Motors.—Anyone who has asked for bids on induction motors knows that the slower the speed in r.p.m. the poorer the motor as regards power factor, starting torque, and maximum torque.

Induction motors are divided into three classes: High speed motors for direct connection to centrifugal pumps; moderate speed motors for belting; slow speed motors for direct connection or gearing to slow speed machines.

The curves, Fig. 12, show these three classes for 60 cycle motors up to 1,000 h.p. Those above line A are high speed, those between A and B are moderate speed, and those below B are slow speed motors. These latter are expensive and are liable not to give satisfaction on account of low power factor, low starting torque, and low maximum torque.

Fig. 12 shows the value of power factor, efficiency, starting torque, and maximum torque, for a line of 60 cycle, open slot, squirrel cage motors, embracing both

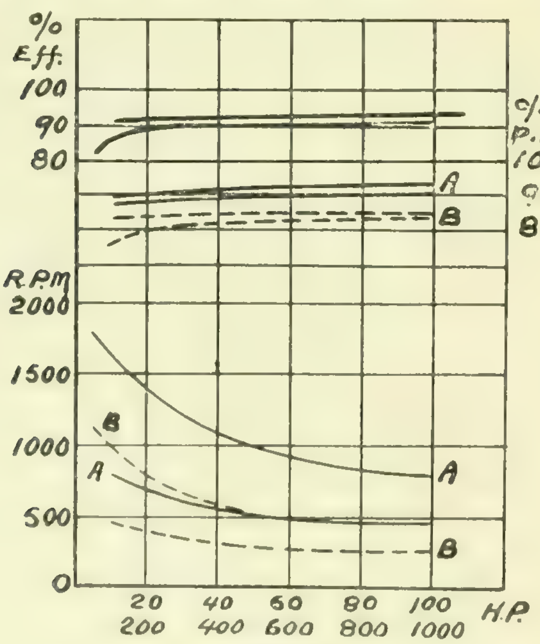


Fig. 12

high and low speed machines. It will be noticed that the efficiency is independent of the speed. The two sets of power factor curves given correspond to the two sets of speed curves A and B. For speeds higher than those of curve A, the power factor does not increase much with speed, but for speeds below B it drops off very rapidly with the speed.

Weights of Induction Motors.—The weight of an induction motor for a given rating lies between two limits: the lower is that below which the machine has not sufficient material and mechanical rigidity to stand the load, the

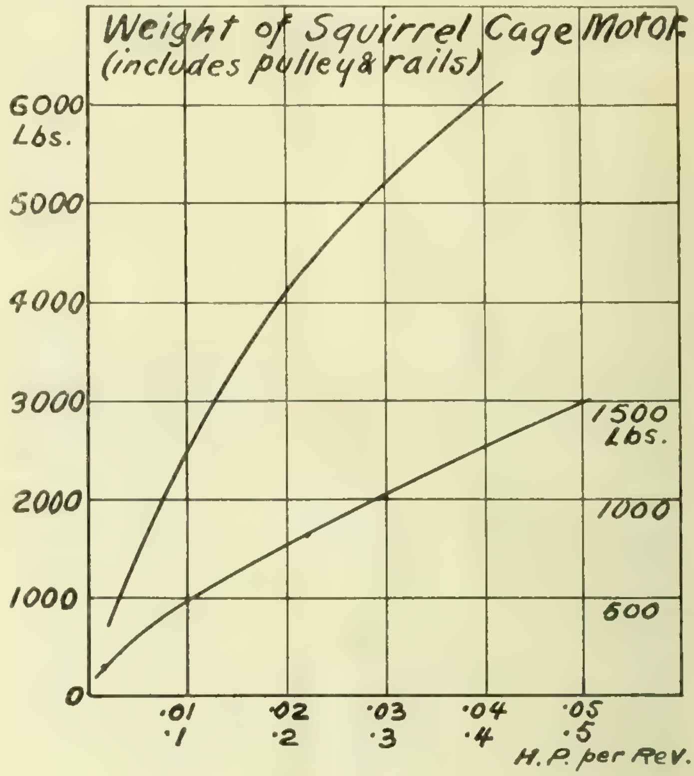


Fig. 13

Wound rotor motors are heaviest—10% for small sizes, 4% for large sizes.

upper limit is fixed by the price the customer is willing to pay for his machine. Fig. 13 shows the relation between weight and horse power per revolution for a line of 60 cycle machines of moderate speeds, that is, of speeds between the limiting lines A and B, Fig. 12. The weights given have proven satisfactory in practice, and the curve is offered for criticism. High speed motors, whose speeds lie above curve A, Fig. 12, will be heavier than moderate speed motors for the same value of horse power per revolution. Slow speed motors, whose speeds are below those of curve B, Fig. 12, will not be any lighter.

In conclusion, the following points are of importance to the purchaser of induction motors:

(a) Adopt 60 cycles for the frequency of the system, if most of the motors needed lie above curve B, Fig. 12 in speed. If most of them lie below this curve, then 25 cycle motors will have better characteristics and should be considered. For slow speed work such as rolling mill work, 25 cycle motors are best, but they are, at the same time, more expensive.

(b) Use 3-phase in preference to 2-phase, as the characteristics of 3-phase motors are the better of the two.

(c) Use 440 volts, as it is the highest safe operating voltage. The cost of cables is inversely as the $(voltage)^2$.

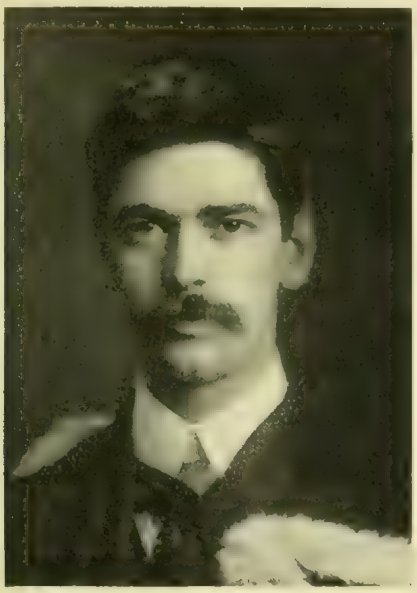
(d) Use squirrel cage motors wherever possible, modifying the drive, if necessary, to reduce the starting torque required.

(e) Avoid variable speed operation as far as possible.

(f) Limit the number of sizes used so as to require as few spare parts as possible.

(g) Adopt the manufacturers' standard sizes and speeds so as to get quick shipment, both of the original machine and of all necessary spare parts.

Mr. A. Miller Gray, author of the above paper, is assistant professor in the electrical department at McGill University with Prof. Herdt, having received this appointment last September. Mr. Gray graduated from Edinburgh University as a civil engineer in 1904, after having put in the regular six years' apprenticeship in addition to his academic studies. Coming to Canada he took a post-graduate course at McGill University and obtained the B.Sc. degree (electrical course) in 1906. Upon graduation here he accepted a position with the Bullock people in Cincinnati and Milwaukee, being, in the latter city, head of the alternating current motor department for the firm, which is now merged in the Allis-Chalmers-Bullock concern.



Prof. A. Miller Gray

Discussion which followed the reading of the paper brought out the statement that 550 volts and three-phase operation are the most used and practically the standard for motors in Canada, it being the opinion that this was true of 90 per cent. of the apparatus. Speaking of frequencies it was asserted that 25 and 60 cycles were mostly used in Canada, while 25 and 50 cycles were most used in England and Germany.

Direct-Current Watt-Hour Meter

The increasing importance of economy in switchboard space, especially in the larger stations, has created a demand for meters of large rating which can be installed in close proximity to each other. The shunted type of meter is especially suitable for this class of service in that the meter itself can be made of smaller dimensions than is possible with the series type of meter in which all the current to be measured must be passed through the meter itself. With the shunted principle the main series shunt can be located at any desired point, the only conductors from the meter being a pair of small leads.

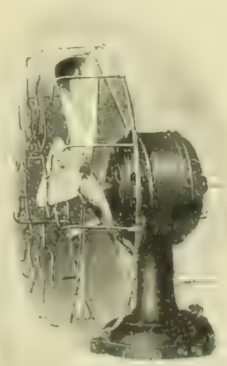
The watt-hour meter here shown is of what is known as the "mercury-motor type," because in it mercury is employed to form the electrical contact in place of brushes as used on the commutator type of meter. At the same time the mercury floats the entire moving system and avoids the necessity of employing a lower step bearing. The result is a practically frictionless mercury-floated moving system which cannot be injured by severe shock or jars, which would soon ruin the usual type pivot-and-jewel bearing. At the same time the absence of commutators and brushes renders the meter free from errors due to sparking or tarnishing, inevitable with commutators and brush contacts.

The shunted principle of operation is especially valuable in meters intended for use in large direct-current switchboards where it is desirable to employ watt-hour meters, recording meters and indicating ammeters. These three meters can be operated from a single shunt, thus effecting a saving which in many cases, such as on a 10,000-amp. circuit, will amount to several hundred dollars on a single installation. In addition to the economy secured by this method of metering, it is also very desirable in that the meters can be quickly anad easily checked without interrupting the main circuit.

The watt-hour meter described above is built by the Sangamo Electric Company, Springfield, Ill.

Electric Fans

A booklet and descriptive pamphlets have just been issued by the Chapman & Walker Company, Limited, Victoria street, Toronto, descriptive of a number of types of electric fans carried in stock at their different Canadian offices. The list comprises direct current ceiling fans, single-phase a.c. ceiling fans, three-phase a.c. ceiling fans, exhaust fans, and desk fans of various standard types for either d.c. or a.c., the latter with swivel for operation in any direction. The catalogue describes the construction of the various parts of the fans, showing the motor structure very clearly, and also deals in a descriptive way with numerous motors of very small horse power. Some space is also given to forge and volume blowers direct connected to these motors for operation by either direct or alternating current or driven by pulley or belt.



Canadian Telephone Progress

The Chilliwack Telephone Company will expend a large sum of money, during the coming season, in extensions and improvements.

The British Columbia Telephone Company have announced their intention to extend their long distance line to Chilliwack this summer. The line now reaches as far as Mission.

The City Hall at Calgary has just been equipped with a new 30 line capacity switchboard to be handled by the city's own operators. The board is equipped so that both automatic and manual service can be operated. The exchange is open from 8 a.m. to 11 p.m.

The Ontario Railway and Municipal Board has dismissed the application of the McKillop Telephone Company that the board's former order should be rescinded. The order in question compelled the McKillop Company to connect with the Brussels Company. This interfered with a contract which the former company had with the Bell Company, hence the appeal which is now dismissed.

The surveying and staking of the telephone line to Oakview is almost completed, and a start has been made in connection with work of construction. It is expected that the line will be in operation early in June. The supplies necessary have been ordered from the Canadian Independent Telephone Company of Toronto. The yearly rental has been fixed at $15 per year, payable half-yearly. Any information in connection with telephones, etc., on application to the secretary, or G. C. Coles, president, Collingwood.

More C. P. R. Telephone Despatching

The work of changing the Canadian Pacific Railway system of train despatching from telegraph to telephone has been commenced between St. John and McAdam Junction, under the direction of Mr. F. J. Mahon. About twenty men are now at work at St. John installing the system at the station there. It is expected that the new service will be in operation by July 1st.

No Exclusive Contracts

The Ontario Railway and Municipal Board has decided not to approve any contract between local telephone companies and the Bell Company which would prevent the local telephone company, from taking and transmitting messages from any other local telephone company with which it now connects or with which it may in the future connect. The board will not approve of any agreement which will have the effect of preventing or restricting intercommunication, joint operation or reciprocal rights between telephone companies under its jurisdiction.

Manitoba's New Telephone Rates

The government of Manitoba has just issued a new schedule of long distance telephone charges. In future no night rate will be given. The standard length of time for a conversation has also been reduced from three to two minutes. The new figures, which are apparently an increase over the old rates, especially if the reduction in time allowance is taken into consideration, are as follows:

Distance	Two-Min.	Ad. Min.
15 miles or less	10 cents	5 cents
15 to 20 miles	15 cents	5 cents
20 to 30 miles	20 cents	10 cents
30 to 50 miles	25 cents	10 cents
50 to 70 miles	30 cents	15 cents
70 to 100 miles	40 cents	20 cents
100 to 130 miles	50 cents	25 cents
130 to 160 miles	60 cents	30 cents
160 to 190 miles	70 cents	35 cents

Victoria's Underground System

In connection with the installation of the underground telephone system which it is proposed to have in Victoria's business section, arrangements are being made so that the permanent sidewalks which are being laid at present will not have to be torn up again. The conduits are being installed while these pavements are under construction, so that when the B. C. Telephone Company is ready to start upon the work of installing the system there will be no occasion for further expenditure on the part of the city. The debentures to be issued under by-law are now ready to be sold by the city. The estimated cost of installing the new system is $100,000.

Bell Telephone Company Gives Long Distance for One Year

The Dominion Board of Railway Commissioners has granted the application of a number of independent telephone companies for an order compelling the Bell Telephone Company to connect with their lines for the purpose of long distance service. In granting the order, however, Chairman Mabee made it plain that the present arrangement would be considered as an experiment only and would only apply for the space of one year. During this time all possible data is to be collected and furnished the commission from time to time, which data will furnish the basis of a permanent order by the board at the end of the year.

The conditions under which connection is to be made require that the Bell Company shall be paid 15 cents over and above their regular charge for each call originating on an independent line. For calls originating on the Bell line and transferred to an independent company no charge is to be made. The board considered such a charge as the above necessary to protect the interests of the Bell Company in towns where there is telephone competition.

The following companies are included in the order, which number cannot be added to during the experimental year—Ingersoll Telephone Company, Harrietsville Telephone Association, Blenheim & South Kent Telephone Company, Wheatley Telephone Company, People's Telephone Company of Forest, South Lambton Telephone Cooperative Association, Port Hope Telephone Company, Markham and Pickering Telephone Company, Niagara District Telephone Company, Brussels, Morris & Grey Municipal Telephone Company, and the Consolidated Telephone Company.

Canadian Commissioner at Paris

The Canadian Trade Commissioner writes from Paris, France, announcing removal of the Canadian office to No. 13 rue Lafayette. The commissioner refers to the necessity of correspondents addressing fully as above for the reason that, in a city the size of Paris, letters insufficiently addressed are apt to go astray. Attention is also called to the 5 cent stamp requirement.

Industrial Progress and Trade Notes

Trade Publications

Revolving Field Alternators—Bulletin No. 1051, issued by the Ideal Electric Manufacturing Company, of Mansfield, Ohio, through their sales agent, B. J. Harpell, 24 Aikins Block, Winnipeg, Man., descriptive of types F. and FW. revolving field alternators.

Yale Products—A letter distributed by the Yale & Towne Manufacturing Company, 9 Murray street, New York, announcing that they propse to erect a plant in St. Catharines, Ont., where they have secured a suitable site, also that an organization under the name "Canadian Yale & Towne Limited," is in process of formation.

Porcelain Cleat Receptacles—Letters number 195, 196 and 197 from the Canadian General Electric Company, descriptive of their porcelain cleat receptacles and switches.

Condulets—Talks number 146 and 147 on type O. condulets, by the Canadian General Electric Company, Toronto.

O.-B. Bulletin—Volume 6, No. 2, published by the Ohio Brass Company, of Mansfield, Ohio, descriptive of electric railway and mine haulage material.

Appleton Electric Company—212-214 North Jefferson street, Chicago. A catalogue descriptive of the complete line of conduit fittings carried by this firm.

Metal Reels and Spools—Catalogue No. 101, issued by the Frank Mossberg Company, Attleboro, Mass., manufacturers of metal spools, steel reels, steel beams, jack spools, flanged and flat discs.

Westinghouse Type G. Generators—Circular No. 1161, issued by the Railway and Lighting Department of the Canadian Westinghouse Company, Hamilton, descriptive of type G. belt driven alternating current generator.

The Electric Stove—A little pamphlet under the name "The Mission of the Westinghouse Electric Toaster Stove," issued by the Westinghouse Company.

Electric Meters and How to Read Them—A little booklet containing information on how to calculate your own electric accounts, issued by the Westinghouse Company.

Electrical Railway Material—Catalogue No. 2, issued by the Indianapolis Brass Company, of Indiana, designers and manufacturers of electric railway materials; describing and giving price lists of their various products; a comprehensive booklet of 135 pages.

Veritys Limited—through their agents, the Central Electric & School Supply Company, Adelaide street, Toronto, have distributed a pamphlet descriptive of their "Aston" direct coupled sets, searchlight projectors, household utensils, fans, etc.

Railroad Electrification Talks—A reproduction of a series of talks and illustrations in the technical magazines in recent months, dealing specially with examples of direct current, single-phase, and three-phase operation.

Electrical Construction Supplies—Catalogue No. 565, issued by the Fletcher Manufacturing Company, of Dayton, Ohio. Well illustrated. Prices of all articles given.

Mesta Gas Engine—A booklet issued by the Mesta Machine Company, describing their horizontal double acting four-cylinder gas engine. The booklet contains comparative results of gas engine vs. steam operation which are very interesting.

Suggestive Specifications—for architects and engineers, covering the "Economy" pumping machinery, as manufactured by Thomas & Smith, 116 N. Carpenter street, Chicago.

Vertical Multi-Cylinder Gas Engines—Booklet by the Bruce-Macbeth Engine Company, of Cleveland, giving a detailed description of the construction of their four cylinder engine.

Masco Single-Phase Repulsion Type Bell Motors—A pamphlet issued by the Masco Company, Limited, 205 Yonge street, Toronto, descriptive of the Bell repulsion type single-phase motor and advancing certain reasons why central stations should insist on Bell motors in preference to other single-phase apparatus.

Steam Turbines and Generators—Bulletin 1079, issued by the power and electrical department of the Allis-Chalmers Company, Milwaukee, Wis. The bulletin describes the construction of both high and low pressure turbines as manufactured by this company and illustrates a number of modern installations, including a unit in the British Columbia Electric Railway auxiliary station.

Agents, etc.

327. **Agents.**—A London firm manufacturing high power incandescent lamps and burners, and high-class gas and electric fittings, are desirous of entering the Canadian market and wish to appoint agents.

407. **Electrical insulators, etc., etc.**—An important and well known London firm, manufacturing electrical insulators in stoneware and porcelain; also conduits, troughing, cable racks and floor tubes, etc., for power stations, desires to get into touch with Canadian importers.

416. **Agents.**—A London company manufacturing water and electric meters is looking for suitable representatives, resident in western Canada.

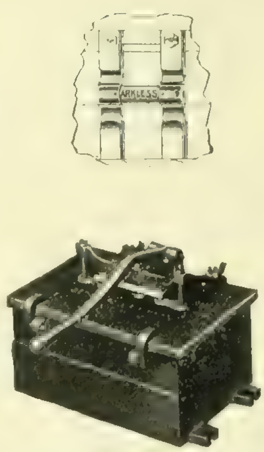
Fireproof Roofing

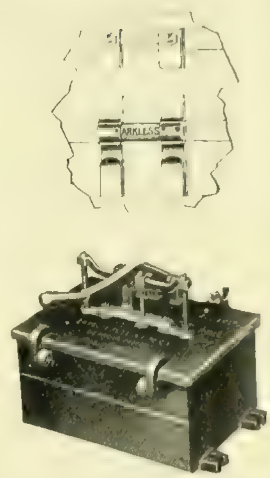
An asbestos roofing, which is said to be so fireproof that it will withstand the flame of a blow-torch for an hour without being injured, is now being manufactured by the H. W. Johns-Manville Company, of New York, manufacturers of asbestos products. In making this roofing, several sheets of asbestos felt are thoroughly saturated with Trinidad Lake asphalt, a mineral compound and permanent waterproofing material. These sheets are then cemented firmly together with this asphalt, making one homogeneous mass. This constitutes an actual covering of stone, which, because of its all-mineral nature, not only offers to a building protection against fire, water, wind and weather, but also, is said not to rot, rust, melt, run or crack, and requires no painting to preserve it.

New Three-Phase Motor Starter

The trade will be interested in a new three-phase motor starter that is being placed on the market by the Detroit Fuse and Manufacturing Company, Detroit, Michigan.

This starter takes care of the heavy starting load by paralleling the fuses, and makes it possible to fuse a three-phase motor at its running load. The "Detroit" Three-Phase Motor Starter is completely enclosed in a cast iron box equipped with rubber gaskets making a fume proof and moisture proof construction. It can be installed where exposed to severe condition, and is substantially made, and designed to hold up under the rougest of handling. The mechanism is controlled by a lever, as shown in the cut herewith. When throwing on the switch the fuses are paralleled by a copper bar, as is noted in the small sketch directly above figure 1. It is necessary to hold this lever down until the motor has reached speed, at which time by removing the hand the lever is automatically thrown out, and the paralleling device thrown out of circuit. This leaves the fuses protecting the motor, as is noted in figure 2. When it is desirous of throwing off the switch, it is only necessary to pull out the lever, as noted in figure 3. This switch is "quick make" and "quick break" with no intermediate position, and it is claimed there are no weak parts tnat can get out of order.





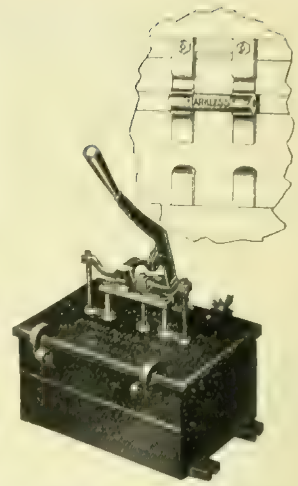
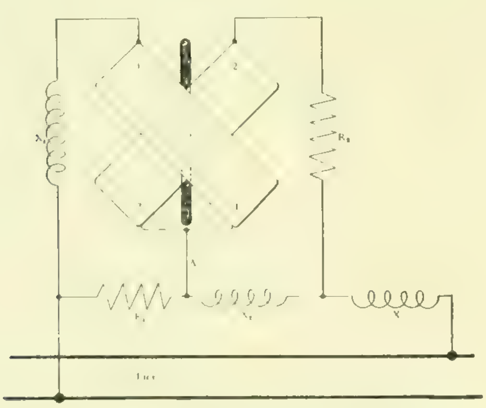


Figure No. 1 -Starting Position. Figure No. 2 -Running Position. Figure No. 3—"Off" Position

Switchboard Frequency Meters

A new type of frequency meter has been recently placed on the market by the Weston Electrical Instrument Company. This meter is of a new type, consisting of a special soft-iron instrument connected into a Wheatstone bridge arrangement of resistors and reactors. The instrument itself consists of an iron needle mounted in a magnetic field produced by two flat coils arranged at right

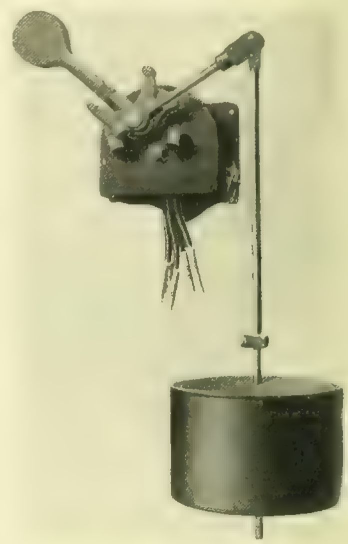


angle to each other. The needle has no spring control, but is perfectly free to align itself with the space position of the resultant field of the two coils.

The connections are shown. The bridge is made up of two reactors, two resistors and the field coils of the instrument. One side consists of a reactor, the two coils of the instrument and a resistor, while the other side consists of a resistor and a reactor. The points between the coils on one side and between the reactor and the resistor on the other side are connected together.

This meter has an extremely light movable system and is equipped with a highly efficient damper; therefore, it is capable of following accurately all fluctuations in frequency. The indications are practically independent of changes in voltages and wave form. For instance, a variation in e.m.f. from 75 to 150 volts produces an error of only 1½ per cent.

An Automatic Float Switch



An automatic float switch of new design has recently been placed upon the market by the Westinghouse Electric & Manufacturing Company. The new design embodies several features that recommend it highly for the control of motors driving pumps that empty into reservoirs, or drain sumps, sewers, etc. The operation of the switch is entirely automatic and the mechanism is said to require no attention beyond an occasional inspection and oiling. The switch is operated by a cylindrical steel float which plays between brass stops on a vertical rod; the stops are adjusted to the upper and lower water levels. When the float presses against either stop, a U-shaped tripping lever attached to the float-rod engages a pivoted weight-arm and carries it upward and around past the vertical position. The weight-arm then falls, engages an arm on the switch drum shaft, and snaps the switch open or closed, according to the direction in which the weight-arm is thrown. A buffer receives the force of the weight-arm's fall. When the float-rod is attached to the tripping lever the pump will be started when the float presses on the lower stop and hence is properly arranged for filling reservoirs. With the rod attached to the other side of the lever, the switch is adjusted for drainage purposes, as the motor will be started when the float presses against the upper stop. The switch is of the drum type with renewable contacts and fingers. These switches are made in two styles, double-pole for direct current and single-phase alternating-current motors, and three-pole for polyphase motors. The maximum capacity of these switches is 50 amperes at 550 volts. The motor is connected directly across the line and hence can be used only with motors that do not require reduced starting voltage.

Office Removal

The Sayer Electric Company have just moved into their fine new premises at No. 87 Bleury street, Montreal.

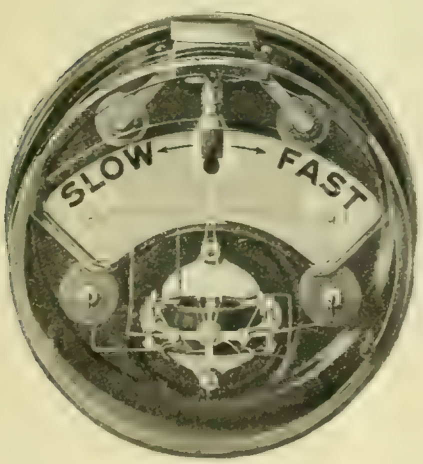
A New Type of Synchroscope

Apart from special devices only applicable to polyphase machines, two devices are in general use for synchronizing alternators, namely: the synchronizing lamp or voltmeter, and the rotating field synchroscope. An objection to the former is that although the rapidity of fluctuation of the lamp or voltmeter reading indicates the difference between the frequencies of the machines, there is nothing to show which of the two machines is the faster. In order to make the lamp method of real service, therefore, it is necessary to combine it with some device for indicating exact coincidence of phase, and whether the incoming machine is fast or slow. This is what it is claimed has been done in a new synchroscope, recently put on the market by the Weston Electrical Instrument Company.

If a Weston electrodynamometer wattmeter has both its fixed and moving coils wound with fine wire, and two alternating voltages are applied to the terminals of those coils, it will show very accurately when these two voltages are in exact quadrature, as the instrument will indicate zero in this case, and deflect to right or left if the phase difference is greater or less than 90 time deg. By connecting a condenser in series with one of the coils, and introducing a small amount of inductance in the other, it is easy to arrange that the instrument indicates zero when the two voltages are in phase or in phase opposition instead of in quadrature, and this can be instantly checked by connecting the two circuits to the same supply. Under these circumstances, if one circuit is connected to the busbars, and the other to the incoming machine, it is only necessary to see that the synchronizing lamp is bright and the wattmeter pointer at zero to be able to throw in without any shock.

But this arrangement would only indicate when the machines are in exact synchronism, and not whether the incoming machine is too slow or too fast. If the speed of the incoming machine is low or high, the lamp will alternately light and grow dark in the ordinary manner and the wattmeter will also deflect to right and left as the voltage of the machine alternately lags and leads with respect to that of the busbars. It is evident that the rate of oscillation of the pointer, like the rate of fluctuation of the light, shows the amout by which the speed of the machine is high or low, although neither of them by itself indicates which.

If, however, the lamp and wattmeter are combined, so that the pointer of the latter is visible only by the light from the former, the difficulty is overcome. This is the principle underlying the new Weston synchroscope.



Phantom View, Weston Synchroscope

The relation between the light of the lamp, currents in the circuits, torque and phase displacement are shown in the accompanying curve diagram, which represents what occurs when the machines to be synchronized differ considerably in frequency. The top set of curves are the e.m.f. waves of the machines and also represent the currents in the lamp transformer which added together form the resultant (shown dotted) current that is active in the lamp. The shaded band shows the limits inside of which the current is not sufficient to light the lamp. When the maximum value of the resultant currents extends outside this band the lamp will glow and the periods of light and darkness are indicated below the curves.

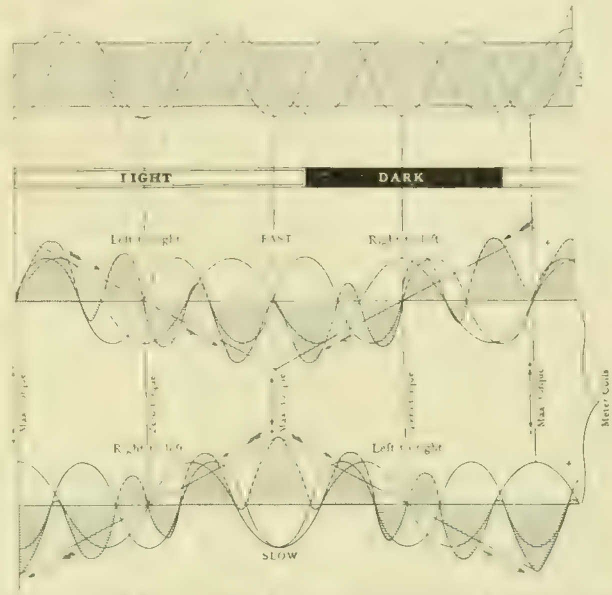
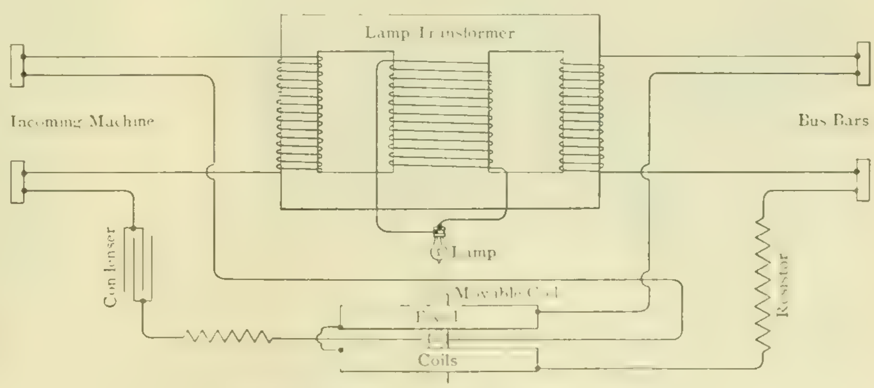


Diagram of Currents and torque in circuit of instrument

The middle set of curves is constructed by assuming the faster wave to belong to the incoming machine, and, therefore, it would be advanced 90 time-deg., or a quarter period on account of the condenser which is connected in series with the movable coil. The torque which is proportional to the product of the instantaneous values of the currents, is shown as waves bounding the shaded areas and the sloping straight lines show the reversals of the average torque. In this case it is seen that the wattmeter pointer swings over from left to right while the lamp is bright, while when it swings back the lamp is dark. In consequence the back swing is not seen, and instead of the pointer appearing to oscillate it appears to rise with the dawn of light at the left hand side of the scale, to swing across in full light and to disappear on the right of the dial with the extinction of the light, almost exactly like



Circuit diagram, Weston Synchroscope

the rising and setting of the sun, and as if it were steadily revolving in one direction. To such an extent is this the case, that to anyone unacquainted with what actually occurs, the pointer simply appears to revolve in one direction or the other depending upon whether the incoming machine is fast or slow. The bottom group of waves shows what happens when the machine is slow, and it will be seen that in this case the lamp is bright as the pointer swings from right to left, and that the direction of apparent rotation is, therefore, reversed. As far as its practical use is concerned, therefore, the operation of the instrument resembles an ideal rotating field synchroscope.

If the frequency is right the pointer will come to rest, its position corresponding to the phase displacement between the machines. The deflection per unit phase displacement is large and fairly uniform, except around synchronism where it is very large, a displacement of 5 deg. corresponding to a deflection of ½ inch.

The accuracy of this instrument is shown from the fact that a test on a 60-cycle, 110 volt instrument from 40 to 80 cycles and from 95 to 130 volts indicated exact synchronism within 1 deg. of phase coincidence.

The Design of Electrolytic Arresters

Oil in the tanks of electrolytic lightning arresters is in contact with the electrolyte in the trays. It, therefore, soon becomes "wet," that is, it absorbs moisture from the electrolyte. It has been found that organic substances, such as wood or fiber, when used between electrolytic arrester trays, absorb moisture from the "wet" oil and thereby become conducting. They carbonize, and difficulties ensue.

So that there can be no trouble from this condition, the Westinghouse electrolytic arresters are constructed with separators of porcelain between the trays. The wooden tie rods, which bind the tray structure together, are not in contact with any trays except the top and bottom ones of each section. A porcelain separator is shown in figure 1, a sectional view of three trays, filled with electrolyte, showing how the separators are used. Four separators are used between each pair of trays. Each stack of

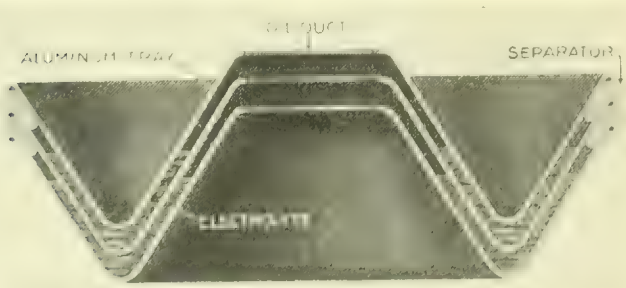


Fig 1. Sectional View, three trays

trays and separators is clamped with iron nuts turning on the threaded ends of wooden tie rods. In each arrester tray there are four holes which, when the trays are stacked, form a vertical oil duct through which oil can circulate. This promotes the discharge of bubbles from the electrolyte and assists in maintaining an arrester at a low temperature when it is operating continuously for a long period. Another feature that assists in the effective discharge of bubbles is the contour of the tray. It will be noted from figure 1 that the outer portion of each tray is of such shape and so inclined that bubbles, forming in the electrolyte, will be discharged directly into the oil. A horizontal lip, formed around the tray edge, would constitute a pocket which would obstruct the bubble discharge. Therefore, such construction has been avoided.

Tray structures for these electrolytic arresters are divided into sections or units, each section being small enough that it can be readily handled by a man when he is putting it in or withdrawing it from a tank. Ample oil space is provided between the tray structures and the inner surface of the sheet iron tank, as shown in figure 2.

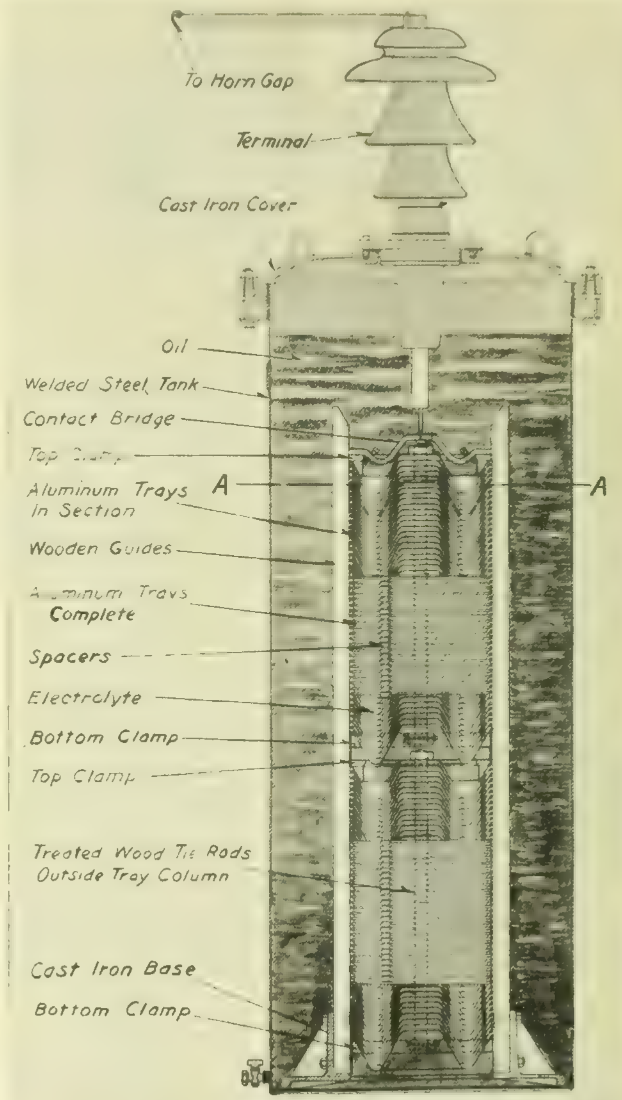


Fig. 2. Sectional View of Complete Arrester

In computing the clearance necessary between the trays and tank, for sufficient insulation, it was assumed that the oil would always be "wet." Two very desirable results accrue because of the allowance for this liberal clearance. One is that the oil volume, and hence the ability of the arrester to discharge continuously, is greatly increased. The other is that it is not necessary to hang a circular screen of some organic insulating material, down in the tank around the tray structure, to prevent arcing between the trays and the tank.

Winnipeg Wiring Contract

The Mitchell Gray Electric Company have been awarded the contract for wiring the new Y. M. C. A. building, in Winnipeg. A very complete system of intercommunicating telephones is to be installed, also a modern fire-alarm system. J. H. G. Russell is architect; Patterson Bros., New York, consulting engineers.

A Kellogg Reminder

A Kellogg reminder in the shape of the well known paper match folder is being distributed. Each match is labelled with the name of an apparatus type, such as "Farm Telephones," "Magneto Switchboards," "Pole Changers," etc. On the reverse side of the folder is given the company name and the principal types of apparatus manufactured. On the end is the familiar "Kellogg" mark in red, while on the front is a well executed lithograph of the Kellogg desk stand with the words "The Service of the Telephone Proves the Worth of the Line." Small cases in variously colored leathers hold these match folders, which may be obtained from the Kellogg salesmen, but on account of government regulations cannot be mailed.

The Peerless Plug Set

A new style of Plug Set has recently been put on the market by the Thompson Levering Company, Philadelphia. This set is designed for testing engineers who prefer a plug type set, or who do not care to go to the extra expense of a switch type set.

The resistance coil blocks and plugs are arranged in numerical order, so that when looking at the set with the plug out, the total resistance measured would read as a column of figures; thus the results may be seen at a glance. The A bridge arm has values of 1, 10 and 100, and the B bridge arm 10, 100 and 1,000. A commutator is provided for reversing the position of the bridge arms, making the range of same from .001 part to 1,000 times the value of the resistance unplugged in the rheostat. The rheostat has coils of 1, 2, 2 and 5 ohms, 10, 20, 20 and 50 ohms, 100, 200, 200 and 500 ohms, 1,000, 2,000, 2,000 and 5,000 ohms. Thus any combination may be obtained and very accurate readings result. The accuracy of adjustment

of the rheostat coils is 1/10 of 1 per cent., and of the bridge arm coils A and B, 1/20 of 1 per cent. The set is equipped with quick make and break switch, to change from Wheatstone bridge measurements to the Murray loop test. Provisions are made for outside battery, in case a higher e.m.f. is required than that furnished by the cells in the set.

The galvanometer is of the D'Arsonval type, with a high sensibility. The magnet is of best grade special magnet steel, carefully aged, and is permanent and strong. The scale has thirty millimeter divisions with centre zero, is well lighted and easily read, and is uniform, making the set well adapted for insulation measurements.

The following tests may be made with this instrument: Measuring resistance by the Wheatstone bridge method; measuring insulation resistance by the direct deflection method; comparing e.m.f's by the fall of the potential method; checking up voltmeters; measuring battery resistance; making the Murray loop test; checking up ammeters by using a shunt of known value; making the Varley loop test; testing out grounds; testing galvanometers.

Spring Clips for X Cells

The Canadian Carbon Company, Limited, manufacturers of X-Cell Batteries, the ones which show Nine Lives, have brought out an excellent improvement on their battery connections by using (instead of the old style split binding posts with knurled nuts and brass caps with threaded studs to which also knurled nuts were attached) spring clips which they attach to the carbon electrodes on X Cells by soldering the spring clip to a flat carbon brass cap. While this may look very simple it is said the improvement hits the point and fills a long-felt demand. All the user of X Cell batteries has to do now is to press down the spring, slip in the wire and to forget everything else about the batteries. No matter how heavy the vibration is, the wires which connect the cells cannot become loose and the trouble encountered before by using pliers has become a thing of

the past. No more screws to turn, no pliers, no more sore thumbs. We show here an illustration of the improvement, which, as we understand, is used now exclusively by the Canadian Carbon Company, Limited, on their X Cell Ignitor type, which type is made especially to meet the most severe conditions of strenuous ignition service. Our representative, who visited the factory of the Canadian Carbon Company, Limited, at 12 Shuter street, Toronto, the other day, was shown the first X Cell Ignitor type made, which was manufactured on April 22nd, 1909. Although being kept for over two years on the shelf under changes of weather conditions, the battery showed, on a Weston ammeter, strong 15 amperes.

We are told that the improvement on the connections of X Cell batteries referred to above has met with such approval by the largest firms in the automobile and motor-boat supply line that they have specified that their future orders should be filled with this new type of connections only, and even the Bell Telephone Company of Canada, who have adopted X Cell batteries exclusively for their apparatus, demand that each cell should be fitted with this latest improvement.

Bell Single-Phase Motor

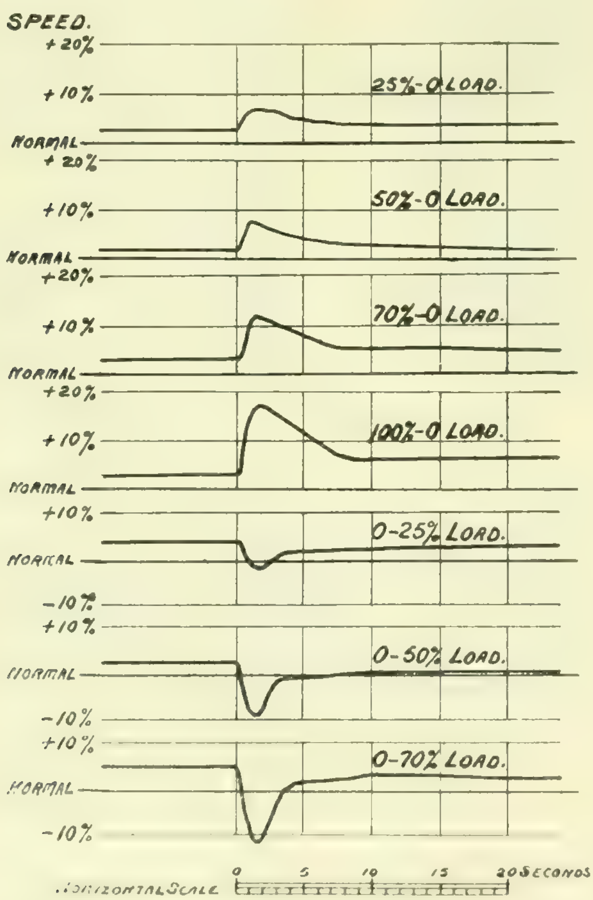
The Bell Electric Motor Company have developed a repulsion type of single-phase motor, claimed to be free from many of the objectionable features of single-phase motors. For starting purposes it is provided with a comlow starting current. Quickly attaining full speed, this

mutator and brushes giving it heavy starting torque with commutator is automatically short circuited by a single ring and the motor runs as an induction motor of high efficiency. On a 5 h.p. motor at rated load this efficiency is 85 per cent. with a corresponding power factor of 83½ per cent.

These results are accomplished under a very low temperature rise, so low, indeed, that at any time iron covers may be applied to convert it into an entirely enclosed motor, and the original horse power rating can still be maintained. By this means it is possible to adapt the same motor to different work and localities, a matter which is further simplified by bringing out four leads, so that the motor may be used on both 110 and 220 volts. This type of single-phase motor can be furnished from one to fifteen horse power for 60 cycle, and from one to seven and one-half horse power for 25 cycles. A full stock is carried at Toronto by The Masco Company, Limited, of Toronto, Canadian distributors for the Bell Electric Motor Company.

Escher Wyss Governor Performance

The accompanying line cuts illustrate some governor diagrams taken under official test at the municipal power station of Zurich, Switzerland, where Escher Wyss gov-



ernors are installed. The turbines in each test are developing 3,300 horse power under a head of 470 feet. By comparing the diagram with the time scale it will be observed that it only takes a very few seconds before, when a load is thrown on or off, a normal constant speed is again reached.

The 1912 Boston Electric Show

This immense electric show which will occupy the whole of the great Mechanics Building, of Boston, with over 100,000 square feet of exhibit floor space has been organized by the Edison Electric Illuminating Company, of Boston. The object of the Boston show is stated to be twofold.

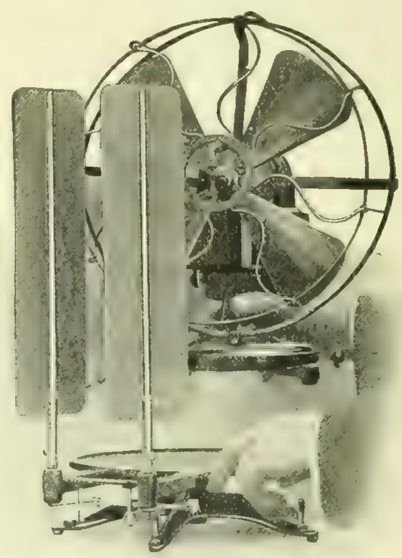
First. To bring together for display the infinite number of electrical appliances and devices, showing by actual demonstration their adaptability to every kind of business.

Second. To give manufacturers every opportunity of presenting the merits of their apparatus and to impress upon the public in general the magnitude of the electrical industry and the readiness with which electric service adapts itself to every condition.

The Edison Company claim that there is no intention to make a profit on this exhibit, but that it is undertaking this work solely to promote the electrical industry and to familiarize the public with the possibilities and economy of electrical service. The date of the Boston Show is fixed for September 28 to October 26, 1912.

The Fan Oscillator

The device shown herewith is for making any fan an oscillating fan. To use this device any fan can be clamped to the table, which rotates, and the wind from the fan blowing on the vanes causes it to oscillate. It can be made to



travel an arc from 1/5 to 4/5 of a circle. The Federal Engineering and Supplies, Limited, of Toronto and Montreal, are Canadian agents.

Canadian Holophane Company Organized

The Holophane Company, Limited, of Canada, has been organized, and will be ready to do business June 1st. The Canadian company will be under the direct charge, as general manager, of Mr. C. A. Howe, who has heretofore had charge of the Chicago office of the Holophane Company. He will be assisted by Mr. H. D. Howe, who will hold the position of secretary in the Canadian company. Holophane, Limited, will have its offices and stock rooms at 60-62 Front street west, Toronto, where a large and complete stock of Holophane Glass and Holophane-D'Olier steel reflectors will be kept in stock for immediate shipment.

The Weston Electrical Instrument Company is represented in Quebec and Western Canada by the Engineering Equipment & Supply Company, Montreal.

Questions and Answers

GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.
4. To avoid trouble and unnecessary delay, correspondents should state their questions clearly, so that there can be no possible doubt as to the information required.
5. In all cases the names of our correspondents will be treated confidentially.

Principles and Mechanism of Master Clock

Q.—In supplying synchronous time to different parts of a city, the same controlled by one master clock, what are the principles and mechanism involved,

A.—As a general proposition the only real clock in such a system is the primary or master clock, which, in addition to the usual clock mechanism, has a set of contact-making devices, for making and breaking the circuit, say at intervals of one minute. The secondary clocks are usually mere dials containing a set of gearing which drives the hands from the movement of the armature of an electromagnet. This magnet is controlled by the contact-making devices in the master clock, so that, for instance, each time the latter closes the circuit the armatures of the secondary clocks move in, and in doing so drive their gearing forward by one notch or tooth of the ratchet wheel with which the armature engages. This would then move the hands forward one minute. When the circuit is opened the armatures spring back to their original position, ready for the next impulse.

Cyclometer vs. Clock Dial Watt-meters

Q.—What are the relative advantages and disadvantages of cyclometer dials for watt-hour meters, as compared with the ordinary clock dial?

A.—The main claim for the cyclomter dial is that it is more simple to read, in that you have the reading always plainly in front of you in the shape of a straight row of figures. This is true if the dial is of the jump type, and it is obviously a point of the greatest value. As opposed to it, though, the introduction of the amount of mechanism necessary to produce the jump action results in a dial which is frequently very unreliable, meters equipped with this type of clock very often being found with one of its number wheels displaced by one or more figures, the result naturally being an entirely incorrect reading. Then again, the jump mechanism makes an irregular load on the meter armature, which at light loads is claimed to cause quite noticeable errors in the accuracy of the meter. In view of the above, the most discriminating buyers are today favoring the ordinary dial. In fact it has certain advantages even in reading, in that, as the position of the hands, as well as the actual figures beside them, is an indication of the reading, there is no possibility of mistaking a 3 for an 8, etc. Again, not being recessed, as most cyclometer dials are, the meter is more capable of being read from an angle. Notwithstanding these slight disadvantages, however, a jump cyclometer dial, if it could be designed so as to be thoroughly reliable, both mechanically and electrically, would undoubtedly be standardized by the great majority of central stations.

In Three-phase System What Becomes of Extra Volts?

Q. In a star connected winding of a three phase generator, the voltage of each phase is computed by dividing the terminal voltage by $\sqrt{3}$. Suppose a machine generates 6,600 v. At the terminals, the voltage of each phase would be $\frac{6600}{1.73} = 3815$ volts. The two phases are connected in series, therefore the voltage would be 7630; what becomes of this extra 1030 volts?

A.—The difference between the sum of the two voltages generated, and the actual reading by a voltmeter, which as you say is in the first case twice the voltage of one leg, and in the second case is $\sqrt{3}$ times the voltage of one leg, is due to the fact that the voltages are never, when they come from a three-phase machine, in phase with each other, but are always 120 deg. apart. Perhaps the easiest way to illustrate the point is to imagine that your two voltages are obtained, not from two of the three legs of a three-phase machine, and therefore fixed with relation to each other, but from two similar but separate single-phase generators, whose armatures can be coupled at any desired angle with one another. Now if they are set so that they generate their maximum voltages simultaneously and are electrically connected so that their voltages aid one another, their resultant potential will be twice that of either one. On the other hand, if connected so that they oppose one another, their resultant voltage will be zero. Any variation from this position of no voltage gives a potential somewhere between zero and twice the potential of either armature, the actual value depending upon the angle of displacement between the two armatures. In a two-phase machine this angle is 90 deg., the combination of the two windings giving a voltage which is 1.41 times that of one of them. In a three-phase machine the angle is 120 deg., and the resultant is 1.73 times that of one winding.

The following is a list of patents granted by the Canadian Patent Office, March 28, 1911, relating to Electrical Arts, and furnished by Fetherstonhaugh & Company, 5 Elgin street, Ottawa Canada.

131,865—Jas. H. Hall, O'Fallon, Ill. Electric cranes. Jas. G. Hall and John H. Hartman.

131,872—W. H. Thompson, Wilkinsburg, Pa., electrical apparatus. Canadian Westinghouse Company, of Montreal, Limited.

131,873—John A. Knight, Hamilton, Ont., removable attachements for giving protection to electric meters. Canadian Westinghouse Company, Limited.

131,889—K. Coleman, Westfield, N.J., motor mechanisms for railway traffic controlling apparatus. The Hall Signal Company.

131,895—B. G. Lamme, Pittsburg, Pa., methods of operating and controlling single-phase alternating current- motors. Canadian Westinghouse Company, Limited.

131,917—R. B. Bashan and P. F. Heyes, Toronto, Ont., electric lamp sockets.

131,966—K. A. F. Heorth, Kristiania, Norway, electric induction smelting furnaces.

131,978—F. Louvrier, Mexico, Mex., electro-metallurgical furnaces.

131,985—M. Maloney, Christchurch, Canterbury, N.Z., telephone transmitters.

131,994—Chas. L. Parker, Vancouver, B.C., art of producing pulsating or alternating currents.

Current News and Notes

Berlin, Ont.

A $20,000 electric light by-law will be voted on by the ratepayers on May 31st, also $7,900 by-law for street railway.

Brandon, Man.

The contract has been let for a new telegraph line from Brandon to Hamiota, and the contractor has instructions to make provision for four cross-arms on each post.

Professor Herdt has reported unfavorably on the proposed agreement between this city and the E. B. Reese Engineering Company. Prof. Herdt is of the opinion that the contract could not be carried out by the company in the stated time.

Brockville, Ont.

It is said, the Light and Power Commissioners will send a committee to investigate the power situation in western Ontario, with a view to collecting data and ascertaining practical results, the same to be presented to the town council.

The town of Brockville has signed contracts with Messrs. Laurie & Lamb, of Montreal, for one 450 h.p. Belliss & Morcom engine with condenser, and with Messrs. Kilmer, Pullen & Burnham, of Toronto, for one 300 kilowatt direct connected generator. This equipment will complete the town power station which has been recently placed in service.

Calgary, Alta.

The power house of the Calgary Power Company at Kananaskis, Alberta, was put into operation on May 1st, 1911, and since this date Calgary Power Company have been supplying power to run the Canada Cement Company's cement mill in Calgary.

The rapid growth of this city is now causing serious inconvenience in the telephone service. Sufficient switchboard space is not available to handle the calls.

C. H. Mitchell, of the firm of Mitchell & Mitchell, Toronto, is in this city, representing the government, to investigate the power conditions on the Elbow river.

A new schedule has been drawn up between the city of Calgary and the large number of electricians who are in the civic employ. The scale of wages is as follows: Foremen linemen, $125 per month; sub-foremen, $4.55 per day; troublemen, $95 per month; linemen, 50 cents an hour; arc lamp trimmers, $75 per month. Apprentice linemen are to start at $2.75 a day and be increased steadily up to three years, when they are to draw $4. The men will work nine hours a day. Overtime is to be paid for as follows: For the first five hours worked the men are to get time and a half; over that time and for Sunday and Dominion holiday work they are to get double time.

Superintendent McCauley is considering the advisability of purchasing a scenic car for the street railway, similar to that used on the B. C. E. R. Company's lines.

The recent passing by parliament of the Alberta Electric Railway Bill means that there will be built, within the next three years, a complete electric railroad between Medicine Hat and Banff, with Calgary as the main seat of operations. This railroad will be operated by the Alberta Electric Railroad Company, formed last October with a capital of $10,000,000. The first portion of the line to be finished will be from Calgary to Banff, it is said, which is expected to be open to traffic in about eighteen months. This section of the line will be some 79 miles in length.

There is to be an addition of three more car tracks added to the east side of the present car barns. Superintendent McCauley will have plans prepared at once.

The East Calgary Corporation Company will apply for a charter to build six or eight miles of electric railway to serve the district to the southeast of the city, in which they hold 4,000 acres of land. The corporation is a holding company representing a small group of property owners who control the land and a subsidiary company will be formed to operate the railway. In the charter application will be made to run the car lines in the portion of the territory outside of the city and obtain permission from the city to connect up with the municipal service at the eastern terminus of the city.

Campbellton, N.B.

Mr. George Sansom proposes to erect an electric plant and planing mill.

Chatham, Ont.

The Chatham, Wallaceburg & Lake Erie Railway may extend the road to Blenheim and Sarnia this summer.

Cochrane, Ont.

The franchise for telephone service here has been given to W. J. Bouldry. Work will commence at once.

Dunnville, Ont.

The town council has granted the Dunnville, Wellandport & Beamsville Electric Railway Company an extension of one year in which they may still receive the bonus of $15,000 voted by the ratepayers.

Dutton, Ont.

The franchise for town lighting now held by the Dutton Electric Light Co., has expired, and the council is negotiating with the Hydro-electric Power Commission for a supply of Niagara power.

Edmonton, Alta.

Superintendent Ormsby, Electric Light Department, has submitted a plan of lighting similar to those in use in eastern cities. All of the wiring in connection with the installation of cluster Tungsten lamps will be underground. He also proposed to install a new system of arc lights, each being of 1,300 candle power, as well as fifty additional arc lamps of the type now in use. The entire scheme would call for the installation of approximately 125 new arc lights as well as eight-five ornamental iron poles, which the superintendent will recommend the city to purchase at a cost of approximately $85 each, while the total cost of the venture will be in the vicinity of $10,000.

The street railway system is now carrying passengers at the rate of half a million a month. Two single end cars have just arrived and six more will be on hand in a few weeks.

J. C. Huffman, of the Canadian Westinghouse Company at Calgary, has been appointed superintendent of the Edmonton power plant, succeeding Superintendent McNaughton.

Farnham, Ont.

Work on the power plant is being pushed forward as fast as possible and the installation of water wheels and machinery has been commenced. The cement work is complete and it only remains to install the engines and dynamos. The town wil have a 24-hour electric service when the new power is turned on.

Fort Frances, Ont.

Engineer S. J. Chapleau, acting for the department of public works, spent a couple of days examining the power situation here.

Galt, Ont.

The rate of 4 cents per 100 feet of floor space plus 4 cents per kilowatt hour, has been announced by the fire and light committee. The total will be subject to 10 per cent. discount.

A by-law to raise $25,000 for extensions to the system will be submitted to the people on May 26th.

Surveyors are at work near Sheffield selecting a right of way for the proposed electric railway between Hamilton, Galt and Sheffield. It is said to be the intention to extend to Guelph.

Goderich, Ont.

A special committee of the Huron County Council, named to investigate and deal with the question of the development of power on the Maitland river, will interview the Hydro-electric Commission on the supject.

Guelph, Ont.

It is understood that the C. N. R. interests have made a definite offer for the People's Railway franchise.

Power at Guelph will cost $25 per horse power for the next year and a half, or until December, 1912. After that it is expected the price will be reduced gradually until it is down to about $20 a horse power. The city commission will not be allowed to install motors free of charge.

Hochelaga, Que.

Mr. R. S. Kelsch, consulting engineer, Montreal, is supervising the installation of switchboards, transformers, motor generator sets, induction and direct current motors for operating the Canadian Rubber Company's new mills here.

Hamilton, Ont.

A Toronto syndicate, represented by Engineer Somerville, is preparing to make a proposition to the city to build

an electric line to Galt, Hespeler and other western towns. Inquiries have been made as to what powers the city has to compel the Cataract Railways to give other railways running rights over their lines into the city.

Jonquiere, P.Q.
Mr. R. S. Kelsch, consulting engineer, Montreal, will purchase the penstocks, water wheels, generators, etc., required for Price Bros. Company's new pulp mills at Jonquiere, P.Q. The equipment will cost in the neighborhood of $300,000.

Kamloops, B.C.
A cluster lighting system will probably be installed here. Estimates have been made and are under consideration.

Kingston, Ont.
The acceptance of the Canadian General Electric Company's tender for a better lighting system for the city was recommended to the council.

Knowlton, Que.
A committee was appointed to report on the cost of installing a municipal power plant.

Lethbridge, Alta.
The tenders of the Westinghouse Co. for supplies for electric light extension in the arc system was recommended by superintendent Reid for acceptance.

The Lethbridge sash and door factory has just discarded its isolated steam plant and installed a 75 horse power motor. Power is purchased from the city at $28.

London, Ont.
The city is considering the placing of 200 more lights, City Engineer Wright; Superintendent Glaubitz.

The London Street Railway Company will put on night shifts to hurry the construction work on Richmond and Dundas streets.

The report of Superintendent Glaubitz on the added necessary expenditure for the distribution of Niagara power was as follows: Sub-station equipment, $8,600; meters, $10,180; meter inspection, $2,000; 2,300 volt bent line, $4,559; primaries, $500; secondaries, $4,390; lighting system, $2,500; transformers, $3,900; power services, $150; power meters, $1,550; series street lighting, $6,800; underground system, $5,150; painting poles, $3,250; draughting room, $400; testing apparatus, $500; motor generator, $10,000; power solicitors, etc., $4,000; lamp renewals, $2,000; total, $70,429.

The turning on of the power on May 1st to operate the water pumps at Springbank was made the occasion of a little ceremony at which Mayor Beattie, Hon. Adam Beck and Commissioner Pocock were speakers.

Magog, Que.
The contract for construction of hydro-electric plant here has been awarded to the Bishop Construction Co., Ltd., of Montreal. T. Pringle & Son, consulting engineers, Montreal.

The Dominion Textile Company has retained the services of R. S. Kelsch in connection with the new power plant to be built jointly by the town and the above company. This plant will be used for supplying light and power to the town, all surplus being consumed at the mills of the Dominion Textile Company. T. Pringle & Son, represent the town.

Melville, Sask.
The by-law for electric light, $23,000, was carried.

By-laws for the construction of waterworks, electric light and storm sewer have been carried by the ratepayers.

Tenders are called until May 25th for supply of the following machinery and materials for delivery during current season: Two 50 k.w. generators; two exciters for same; three 2,300 volt a.c. motors; 1 marble switchboard, etc.; 300 cedar poles; 3 tons copper wire; 10 lighting transformers, 2,300-110 volt; series street lighting system; two 3-stage turbine pumps; one 6-in. vertical submerged type centrifugal pump, with shafting and piping; about 3 tons of 10-in. standard c. i. water pipe; about 60 tons of 8-in. standard c. i. water pipe; about 200 tons of 6-in. standard c. i. water pipe; about 25 tons of 4-in. standard c. i. water pipe, special castings for all above sizes; 4-in., 6-in. and 8-in. gate valves and valve boxes; 44 fire hydrants; about 17,000 lbs. of pig lead; about 1,000 lbs. of oakum; 400 ft. of 8-in. wood pipe. Information obtained from John Crow, secretary-treasurer.

Medicine Hat, Alta.
Consulting Engineer Maxwell and Mayor Milne have worked out a new schedule of prices which will probably be endorsed by council. The new rate is 1½ cents per kw.h. for manufacturing purposes and 8 cents per kw.h. for lighting.

Midland, Ont.
The by-law to expend $13,000 in the installation of light and power equipment passed by a good majority. Power will be obtained through the Ontario Hydro-electric Commission from the Simcoe Railway & Power Company.

Millbrook, Ont.
The Seymour power by-law was carried. Work on the new sub-station will be commenced at once.

Minnedosa, Man.
The Minnedosa Power Company, of Minnedosa, Manitoba, has resumed construction operations, and will carry the whole works through to completion this summer. It is expected that power will be available about August 15th. This plant will take water from the Little Saskatchewan river. Mr. H. F. Maulson, Minnedosa, is secretary, and Messrs. C. H. & P. H. Mitchell, Toronto, are the engineers.

Moncton, N.B.
Another big gas well has been struck by the Maritime Oilfields Company at a depth of about 1,570 feet. Under test it shows four million feet of gas a day. Mr. O. P. Boggs, manager.

Montreal, Que.
Sir Wilfrid Laurier has promised that a commission shall be appointed to investigate the matter of the construction of a dam across the St. Lawrence river between Couteau du Lac to Clark's Island, request for which is made by the Canadian Light & Power Company.

A new power house and laundry for the Windsor Hotel here will be erected. The power house will have a capacity of 800 h.p. R. S. Kelsch, consulting engineer.

The city council passed a resolution asking the Railway Commission to order all railway companies entering Montreal to use electric engines within the confines of the city, so as to obviate the smoke nuisance caused by locomotives.

Moose Jaw, Sask.
The contract for the power house and car sheds for the Moose Jaw Electric Railway Company has been let to Navin Bros. The buildings will cover a space of 250 x 63 feet.

Nanaimo, B.C.
The B. C. Hydraulic Company is applying to the city council of Nanaimo for an electric franchise for that city.

New Westminster, B.C.
The electric light and water extensions by-law has carried.

Niagara Falls, Ont.
Recommendations for the purchase of the necessary transformers for the new Bell Telephone plant were submitted to council.

Ottawa, Ont.
The contract for supply of 150 more poles for the lights on Bank, Dalhousie and Queen streets, was awarded to the Canada Foundry Company, Toronto, $44.60 per pole; the lowest. No. local firms tendered. Sparks street poles cost about $47.

In view of the fact that paving operations will be commenced on Sparks street in the course of about ten days, it seems well to go ahead with the underground conduit system at the same time, for which the city engineer has prepared plans. Engineer Duckworth, G. N. W., Toronto, will come here to confer with the city engineer, the local telephone and Ottawa Electric companies and others interested in the laying of the conduits. Providing an amicable arrangement can be arrived at all the poles on Sparks street will be removed and telegraph, telephone, Ottawa Electric, Municipal electric and other wires will pass through the conduits under the sidewalks. In order to do away with the poles supporting the trolley wires the city engineer has planned to have the sustaining wires attached to the buildings on either side of the street. 674 pairs angle bars with 6-in. centres; 105 pairs angle bars with 6-in. 5-in. 6-in. centres; 26,000 5½ x 9-16 spikes; 3,300 4½ x ⅞ bolts. Delivery on or before May 25th, 1911. Tenderers to quote price f.o.b. point of delivery. J. McTeigue, City Clerk.

The National Hydro-electric Company have been incorporated, with Mr. Henry Mills president and Mr. Louis Gosselin secretary. It is proposed to develop Carillon Falls on the Ottawa river, where upwards of 190,000 h.p. is calculated to be available. Carillon Falls is about 35 miles from Montreal.

The tender of the Canada Foundry Company for 150 ornamental street lighting poles for Bank, Dalhousie and Queen streets, has been accepted. The price was $44.60 per pole.

Conduits for the Ottawa Electric Company, the G. N. W., and the civic electric department will in all probability be laid underground on either side of Sparks street from Bank street to the canal, under the Plaza Laurier and along Rideau street to little Sussex street.

Peterboro, Ont.

Contractors are at work on the Auburn dam construction, for the Electric Power Company.

In a recent address here on the question of the municipality acting with the Hydro-electric Commission to deliver power to this city, the Hon. Adam Beck stated that the most likely point of development would be Healey's Falls.

Penetang, Ont.

This town voted on May 1st to issue debentures to the amount of $27,000, the proceeds to be used, part in the purchase of the plant of the Penetanguishene & Midland Electric Street Railway, Light & Power Company, and part in the reconstruction of the system. This expenditure is preparatory to using power to be supplied from the Simcoe Railway & Power Company's development at Big Chute on Severn river, the Hydro-electric Power Commission.

Pincher Creek, Alta.

The Chamber of Commerce recently passed a resolution asking the council "to immediately investigate the feasibility of securing a site on the lower end of the south fork canyon for the development of electrical power for the town of Pincher Creek."

Port Credit, Ont.

The Hydro-electric Power Commission's engineers will submit estimates of the cost of the installation of an electric lighting system. The cost is placed at about $15,000.

Portage la Prairie, Man.

The power committee appointed at the last meeting of the council brought in a motion appointing W. E. Skinner, electrical engineer, of Winnipeg, to give an estimate of the cost of a transmission line from Winnipeg to this city; also the cost of replacing the plant of the Central Electric Company and the cost of a transformer station at this city.

W. E. Skinner, of Winnipeg, has been engaged in making, for the city, a valuation of the plant and distributing system of the Central Electric and Gas Company.

Prince Albert, Sask.

Tenders are called until June 13th for construction of dam and headworks and canal and power station foundations for this city.

Tenders addressed to the City Commissioners are called until May 31st for supply of electrical machinery. A. Holmes, C. O. Davidson and F. A Creighton, city commissioners.

The City Commissioners have accepted the following quotations for electrical supply material for year: cross-arms, to the Cameron Lumber Co.; cedar poles, two 2-car lots, Lindsley Bros.; copper wire, Eugene Phillips Electrical Works; also accepted quotation of Vandeleur & Nicholls for one 15 h.p. induction motor to be used for driving new elevating machinery in connection with present rock-crushing equipment. R. Wright, city electrician.

Prince Rupert, B.C.

A proposition to supply Prince Rupert with gas for lighting and cooking purposes, electric power for industries and street cars was outlined to the city council recently by Raymond Brutinell, representing the Tsimpsean Light and Power Company. The company proposes to spend $3,000,000 on the enterprise and briefly the pioposition is to supply gas at$1.25 to $1.75 per thousand feet; electric power up to 50,000 horse power at $30 per h.p. year, with a reduction after 5,000 horse power is taken; to build a line for street cars and run them when the city has 15,000 people. Under the agreement the gas plant will be installed here, and electric power will be transmitted from a point forty-two miles up the Skeena river and the company will give the city from 3 to 10 per cent. of the gross earnings of the street cars.

Renfrew, Ont.

This municipality will spend about $117,000 in the construction of the power plant inclusive of site; work probably will be done by day labor. Engineer in charge, J. R. Stewart, Renfrew. W. E. Smallfield, chairman, wateiworks committee.

Ruskin, B.C.

The erection of the steel towers by the Western Canada Power Company for power transmission to Vancouver is being rushed.

Regina, Sask.

Rail laying on the municipal street railway system has started. It is confidently expected to have the line in operation in time for the Dominion exhibition. Alderman Robert Sinton had the honor of driving the first spike.

Sandwich, Ont.

A franchise has been granted R. Stuart to run a line of poles and wires across town to carry electric power developed from a plant to be constructed in Sandwich.

Saskatoon, Sask.

The city engineer has been authorized to secure information on the cost of installing, operating and maintaining a street railway here as a municipal enterprise. Prof. Greig was instructed to report on the relative methods of producing power for the city's use.

Shawinigan Falls, Que.

The Shawinigan Watei & Power Co. will continue the work on the new power building during the summer. Tenders will be asked for the installation of a 10,000 h.p. dynamo and corresponding turbine.

Stettler, Alta.

The council contemplate the installation of an electric light plant costing $17,000. D. Mitchell, secretary-treasurer.

The by-law to erect an electric power and lighting plant was carried. The power plant, providing for 2,500 16 c.p. lights, will be erected at once.

South Qu'Appelle, Sask.

The Electric Light Company here contemplate erecting a more substantial power house, and also installing gasoline power. L. G. Bell, sec.-treas., board of trade.

St. Thomas, Ont.

It has been decided to recall the proposed by-law for $35,000, for the renovation of the street railway system.

Stratford, Ont.

Negotiations are under way between the Stratford Railway Company and the city council which it is hoped will result in construction work being started in the very near future.

Sydney, N.S.

The Cape Breton council has granted the new monorail company, recently incoroporated as the "Sydney East Bay and New Waterford Monorail Company," a bonus of one thousand dollars a mile and exemption from taxes for five years. No work has yet been done on this system.

Seaforth, Ont.

Mr. R. S. Kelsch, consulting engineer, Montreal, will equip the Ogilvie Mills at Seaforth, Ont., for receiving power from the Hydro-electric system.

Sudbury, Ont.

Mr. Wm. McVitte has commenced the construction of another power plant at a point known as the Water Fall, six miles below Wahnapitae. The building is designed for installation of three units of 1250 kilowatts each, of which two will be put into service first. The third will be installed as soon as the service requires. It is expected that the greater part of the power will be taken by the Mond Nickel Co. at their new plant at Romford.

Sherbrooke, Que.

The 23rd annual stockholders' meeting of the People's Telephone Company was held at the company's head office, May 9th, 1911. The annual statement showed the company to be in a prosperout condition. The number of telephones has greatly increased since last year and the earnings of the company are around the $20,000 mark. At the directors' meeting following the annual meeting, Mr. C. H. Fletcher was elected president; Dr. H. A. Meagher, vice-president; Mr. C. J. Wright, general manager and secretary-treasurer, and Mr. H. E. Morgan, superintendent.

St. John, N.B.

Notice has been given by H. A. Powell in the Royal Gazette of application for incorporation, by letters patent, of the New Brunswick Hydro-electric Company, which recently failed to secure incorporation in the legislature. Incorporation by letters patent will give the company all the rights it requires, except that it will not have the power to expropriate. It is pointed out now that some of the arguments made in opposition to the Hydro-electric bill in the legilsature were based on a misunderstanding, for, as a matter of fact, the company owns the water powers which it proposes to harness, having bought them from the Reynolds estate, which bought them from the province fifty years ago. It is understood that the company will go on with the work of development, and that it will be an active competitor in the power market in St. John within the next year or two. This company proposes to develop water power at Lepreauvx Falls.

Stayner, Ont.

A company known as the "Oakview Telephone Company, Limited," has been formed in Stayner, and a line is now in the course of construction from Stayner to Oakview. Long distance connection with the Bell Telephone Company has been arranged for, and a number of rural telephones contracted for. The company is made up as follows: President, Geo. C. Coles, Col

lingwood; vice-president, Jos. Knox, Stayner; secretary, Thos. A. Holbrook, Stayner; treasurer, W. A. Doner, Stayner; directors, H. C. Shepherd, R. F. Young, B. Wheeler, T. J. Watson, W. J. Craven.

Vancouver, B.C.

The $3,000,000 issue of the B. C. Electric Company recently offered on the London market was over subscribed.

Mr. B. S. Jenkins, western superintendent of the Canadian Pacific telegraph system, states that during the present year no less than 7,000 miles of copper wire will be strung in British Columbia. Mr. Jenkins says it is the intention of the company to install direct service during 1911 between Vancouver and Chicago.

A nine-months' extension of time in which to complete delivery of power to this city has been granted the Western Canada Power Company. One turbine is now on the way from Europe.

An additional 10,500 horse power is being added to the generating plant of the British Columbia Electric Railway at Lake Buntzen, and contracts for the installation of the generator, water wheel and pipe line have been let as follows: The Canadian General Electric Company received the contract for the generator; McDougall & Co. the contract for a Dobie water wheel. McDonald & Godson, a local firm of contractors, were given the contract for laying the large pipe connecting the power house with the dam at the lake. The installation of the mammoth wheel will make the fourth of its kind at Lake Buntzen, which along with three 3,000-horse power generators are already generating power for the company's systems on the mainland. Work on the latest addition will be completed in October.

Notice has been given of the application of the Howe Sound Power Company, Ltd., for water rights for power purposes on Furry Creek, a stream which flows into Howe Sound.

Victoria, B.C.

Messrs. Hutchinson Bros. will be awarded the contract for the installation of the electrical system for the cluster lights on Fort street, $1,400. This price does not include the iron standards.

Reductions in the charges made by the Dominion government radio-telegraph service for transmitting messages have been announced and take effect at once. A ten-word aerogram may now be sent for 50 cents, whereas in the past $1.80 has been the rate. This new rate applies only to ships business, in cases where a captain wishes to inform the manager of the company of his position or the manager wishes to flash orders to the skipper.

For the purpose of carrying out the extensive additions to the city's street lighting system the following apparatus and plant will be purchased: Thirty-five thousand feet of three-inch fibre conduit, at $7.50 per hundred feet; $50,000 feet of one inch galvanized steel conduit, at $8.40 per hundred feet. Tenders will be called for a supply of 150 cedar poles; 8,000 pounds of copper line wire; 1,000 pounds of flexible arc cable; 1,000 glass insulators; 150 magnetite arc lamps and cut outs; 4.50 light transformers, and 1- [illegible]

Welland, Ont.

The officers of the Niagara, Falls, Welland & Lake Erie Railway Company are, president, C. J. Laughlin; vice-president, F. C. Carlston, Los Angeles; secretary, A. P. Laughlin; treasurer, D. L. Stafford of Dunkirk. The president states that the line between the M.C.R. and G. T. R. depots will be completed in three or four months from May 15th, and that the whole street car system will be completed within the time required by the franchise. Power for operating this road will be obtained from the Ontario Power Company of Niagara Falls.

Woodstock, N.B.

At a meeting of the Eel River Light, Heat and Power Company, Limited, for organization and election of directors, the following were elected: John G. Murchie, president; H. A. Connell, vice-president and general manager, and R. G. Lee, secretary-treasurer. The directors authorized Mr. Connell to proceed with the work of survey immediately. There is a fall of about 70 feet on the Eel river and 4,000 h.p. can be developed.

Winnipeg, Man.

A formal request has been received from the town of Selkirk asking the city to name terms for a block of 500 horse power for water and light purposes.

With the large quantity of surplus power which will be available when the city plant commences operations, it is proposed to make Winnipeg an unusually well lighted city.

The threatened difficulty between the Winnipeg Electric Railway Company and its employees is settled, the men accepting the original offer of the company of the increase of about 2 cents an hour all round.

The board recommended that the tender of the Canadian Fairbanks Company for a motor car to be used on the city's railway line from the C. P. R. switch to Point du Bois, be accepted. The price of the motor car, which will be used for both passengers and freight, is $11,169.

Condensed Department

RATES

Positions Wanted, Positions Vacant, Miscellaneous. — 2 cents a word and 25 cents for a heading, per insertion.

[illegible] advertisements, equipment for sale, etc., 15 cents per agate line (14 agate lines [illegible]) per insertion.

Advertisers who wish to conceal their identity [illegible] an Electrical News box [illegible] extra charge.

Forms close on the 18th of each month.

Tenders for Telephone System

Tenders will be received up to noon on **Wednesday, May 31st, 1911**, by the secretary of the [illegible] Brooke Municipal Telephone [illegible] construction of a system [illegible] the town [illegible]

Plans and specifications and all particulars [illegible] application to the [illegible]

H. R. CARRUTHERS,
[illegible]
[illegible] Ont. 6-6 21-21

WANTED

a large and well equipped factory. Will make under contract or on royalty metal specialties, electrical device preferred. Will buy outright any patent article of merit.

For further information address Box 248, Electrical News, Toronto, Ont. 4-4

For Sale

One S.K.C. Dynamo 2-phase, 60 k.w., 1,040 volts, 133 cycles, 1333 revolutions per minute, including switchboard and instruments, with exciter, Edison 1½ k.w., with spare armature. This outfit can be seen running at plant of the Alliston Electric Light Company, Alliston, Ont.; the reason for selling is that this machine is being replaced by a larger one. 3-6

The City of Prince Albert

Tenders for Machinery Equipment

La Colle Falls Power Station

Sealed tenders will be received up to noon of **June 26th, 1911**, by the Corporation of the City of Prince Albert, Province of Saskatchewan, for the following:—

Hydraulic Power Equipment, including
- 3 1,300 h.p. Vertical Turbines;
- 2 250 h.p. Vertical Turbines;
- 5 Governors for above.

Electrical Power Equipment, including—
- 3 937½ K.V.A. Generators;
- 2 150 K.W. Exciters
- 2 1,850 K.V.A. Transformers;
- Switching Apparatus;
- Lightning Arresters;
- Voltage Regulator.

The plans and specifications will be on file and may be seen on and after **June 1st, 1911**, at the City Hall, Prince Albert, or at the offices of the Engineers, C. H. and P. H. Mitchell, Traders Bank Building, Toronto.

The City reserves the right to reject any or all tenders on these Works.

ANDREW HOLMES, Mayor. C. O. DAVIDSON, Secretary-Treasurer.
City of Prince Albert. 6-6

Positions Wanted

Practical man with eight years experience operating and construction work, wants position as Electrical Superintendent of small plant with a future, or would prefer position as Chief Electrician of an industrial plant. Graduate of I. C. S. and Associate A. I. E. E. Correspondence invited. Box 269 Electrical News, Toronto, Ont. 6-6

Miscellaneous

WANTED—A large American manufacturer wants a good representative supply house in main cities of Canada to handle their line of A.C. and D.C. Watt Hour Meters. A good proposition. Address E. J. Macintyre, care Electrical News, 220 King street west, Toronto. 6-6, 19-20

Electrical News

Generation, Transmission and Application of Electricity

PUBLISHED MONTHLY BY

HUGH C. MacLEAN, LIMITED,

HUGH C. MacLEAN, Winnipeg, President.
THOMAS S. YOUNG, General Manager.

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ADVERTISEMENTS.

Orders for advertising should reach the office of publication not later than the 20th day of the month preceding date of issue. Changes in advertisements will be made whenever desired, without cost to the advertiser.

SUBSCRIPTIONS.

The "Electrical News" will be mailed to subscribers in Canada and Great Britain, post free, for $1.00 per annum. United States and foreign, $2.00. Remit by currency, registered letter, or postal order payable to Hugh C. MacLean, Limited.

Subscribers are requested to promptly notify the publishers of failure or delay in delivery of paper.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 21 Toronto, July, 1911 No. 7

Time and Money Saved

It would appear that in spite of the almost limitless powers of the Ontario Hydro-electric Power Commission there are vital points at which either they cannot or dare not impose the necessary authority. The policy of the Commission has been, apparently, to leave the matter of local distribution in the hands of the various municipalities. These are governed often by men who have no definite ideas on the actual requirements in the way of, for example, the quality or the method of installation of the equipment and whose policy too often has been to use unsatisfactory apparatus, unapproved methods of installation, and incompetent or inexperienced supervision. A report is just to hand that one of the towns served by the Hydro-electric system, after spending enough time and probably also quite enough money to provide this municipality with a proper system, has been forced to call in the help of approved engineers and if further report is true will be put to large expense and delay before its citizens can hope to reap the benefit of a modern electric service.

And the trouble does not end here. Failure of the government system to make good at any single point creates an unfavorable impression throughout the whole area served. It also, and this is a very serious matter, tends to disorganize the actual operation of the whole system. Evidently such weak points should not be allowed to exist by a commission which holds the power to eliminate them, and no municipality which is a unit of such an important and comprehensive scheme should be allowed to install a system of distribution of power and light which does not meet the unqualified approval of a competent engineer.

We believe, however, that the government's duty practically ends here, and quite so, unless it can be of service in an advisory capacity. We do not think the government has any right to assist individual municipalities in work which does not come within its own province. Indeed, if such engineers can be spared it is an indication that the government staff is too large. If, on the other hand, such engineers act in a private capacity while still employed by the government, an unfair advantage is taken of private engineering firms, in that government influence is used to secure the appointment. If, as has been hinted, the government engineers act in a private capacity at reduced rates we have the condition of our government placing its engineers on the bargain counter in direct competition with the engineers it is yearly, through its universities, creating and authorizing to charge a fair return for service rendered.

The fields of the Commission and of the engineering profession lie adjacent but do not overlap. The Commission should insist, in the interests of its great scheme, that every municipality should install and operate under approved supervision, but the choice of engineer lies, subject to government approval, with the municipality. The choice of an engineer is an easy one for the field is large, but—it does not include the government staff.

A Canadian Electrical Association

It will be a great pity if something really conducive to the electrical interests of Canada does not result from the discussion of the affiliation of the Canadian Association with the N. E. L. A. The indifference with which the whole matter is viewed by many prominent electrical men is one of the most noticeable factors in the whole situation. This is especially true of our electrical engineers. The fundamental indifference, plainly, is as to the existence or otherwise of the association at all, for manifestly if one were interested in the association one would be equally interested one way or the other in its affiliation.

The cause of the indifference probably lies in the restricted scope of the Canadian organization which does not, properly speaking, cover the field of an electrical association, but is interested rather in only one or more special phases of the operations connected with what such an association should be. Whether or not this is true by its constitution it certainly holds good in the operation of the association during the last few years. As operated in the recent past at least it would be better named an Electric Light Association or a Central Station Association or a Commercial Section of an Electrical Association. In fact, it is merely a sub-section of what a Canadian Electrical Association might be, and hence is of interest to only a section of electrically interested men.

It is inconceivable that a Canadian Electrical Association should fail to enlist the assistance of that very class of men who make the science of electrical construction and operation their life work—the electrical engineers.

Hence the present scheme of affiliation does not mean sinking the identity of a real electrical association. The time is due, in any case, for the formation of a Canadian Association of Electrical Engineers with branches in all the more important centres where monthly meetings can be held and matters of importance in the electric science discussed. We believe the proper solution of the question would be the retention of the old name and the formation of sections, at the start (say) two, the section of

electrical engineers and the commercial section. With this as a framework it would be possible to build up an association of such a scientific standing that it would rank equal with the organizations of which we form now—or propose to form—only minor parts. It is well to consider that Canada, on account of her unusual advantages, will probably rank in the near future as the greatest electrical country in the world and no move should be made which may hamper the progress or place our natural advantages in any way subsidiary to another country.

Aluminum Wire for Motor Field Coils

A report just issued by the International Street & Interurban Railway Association gives some particulars of the use of aluminum wire in field coils of railway motors. Twenty-five electric railway companies in Europe are employing aluminum field coils in their motors. Most of the companies have equipped only a few of their motors in this way, but the Hamburg Street Railway Company has equipped 120 motors, all of the G. E.-800 type, in this way, and the Elberfeld Railway has equipped all of its fifty-four motors.

The section of aluminum wire to provide the same amount of conductivity as copper must be 1,687 times as large at zero degrees C. The actual coil, however, is no larger, because it has been found possible to oxidize the surface of the aluminum wire so that no textile insulation is required. The weight of the coil, also, is only 50 to 55 per cent. that of a corresponding copper coil, amounting to about 250 lbs. for two-motor car. The cost is also lower, even including the value of the scrap, which is higher for copper than for aluminum.

Most companies use cambric, paper or other insulation between the different layers of the aluminum field coils, but none between wires composing the same layer.

Several methods are employed for oxidizing the wire in order to provide the non-conductive surface. One company, while the coil is being wound, moistens the cambric insulation between the coils, and also the wire itself, with a brush. When the coil is finished, and before the outer insulation is put on, a current is passed through the coil sufficient to raise the temperature of the wire to about 100 deg. C. The insulation resistance of the surface of the wire then gradually attains its normal value. Another company anneals the aluminum wire by raising it to a temperature of from 200 to 300 deg. C. before the coil is wound. Water is applied as before, but the coil is baked in an oven and the process is repeated once or twice. The General Omnibus Company coats the wire and coil with a plastic material having a clay base which gives a mummified coil.

The report calls attention to the fact that in addition to the other advantages of the use of aluminum the maintenance of the coil is low because its lightness reduces the injurious effect of the jars to which these coils are subject. It says, however, that care must be taken in winding it to avoid joints in the wire, because it is difficult to make satisfactory joints; also, that care should be taken when soldering on the field coil terminals, to avoid the formation of oxide on the surface of the aluminum wire.

Canada's Growing Trade

The Department of Trade and Commerce has [illegible] issued its summary of the trade of Canada for the fiscal year 1910-11, which shows that Canada has taken another stride forward in her progress as a commercial nation.

The total of imports for consumption and exports was $759,000,000 greater by $82,000,000—over 12 per cent., or one-eighth—than that of the previous year, which was also a record maker in point of trade. [illegible] imports which were not entered for consumption, making the grand aggregate of Canadian trade for the year $769,000,000—about $76,000,000 increase over the previous record. Imports for consumption show an increase of $86,000,000—almost 23 per cent. Of this increase about two thirds was dutiable goods, and the Customs duties collected were greater by $12,000,000—20 per cent., or one-fifth—than in the previous year.

Compared with the year 1909-10, total exports show a decrease of about $4,000,000, but compared with the greatest year total previous to 1909-10 the increase is over $17,000,000. The decrease may be said to be due to a drop of $8,000,000 in agricultural products and to slightly lower totals in the animal and forest classes. To counterbalance this there is a splendid increase of almost $4,000,000 in the amount of manufactured goods exported while mines give an increase of $2,700,000.

In the lists of principal articles of trade, increases will be seen in the imports for consumption including $22,000,000 in iron and steel, $6,000,000 in wood, nearly $5,000,000 in cottons, $3,000,000 in coal, $2,500,000 in sugars, $2,400,000 in bread-stuffs, $2,000,000 each in oils and in drugs, dyes and chemicals, $1,800,000 in fruits, $1,600,000 in woolens and $1,000,000 each in electric apparatus, gutta percha, leather, paper and silk. Decreases were few and very small. An increase of $4,000,000, or 40 per cent. in the value of effects brought in by new settlers tells its own story of the class and extent of immigration.

The statement of principal articles exported shows the decreases of $7,000,000 in wheat, $3,000,000 in apples, and $1,000,000 each in cattle, coal, fish, hides, cheese and wood. While these changes must be due in a large measure to smaller crops, owing to unfavorable weather conditions, the enormous increase in home consumption is an important factor in reducing the quantity of goods available for export. The articles of export showing increases include silver $2,000,000, iron and steel $1,800,000, bacon and hams $1,700,000, cordage $1,000,000, hay and seeds each $900,000, paper $800,000, salted codfish and furs each $700,000, leather $600,000, wood pulp and nickel each $500,000. Many of these are articles which require in their production a large expenditure of labor and the increased exportation of such goods is indicative of Canada's growing importance as a manufacturing country. A decrease of about $4,000,000 in the exports of foreign goods is balanced by an increase in the exports of coin and bullion. A decrease in total exports does not show lessened demand for Canadian goods abroad, but merely a decrease in the amount of goods available for export, as explained above. On the other hand, an increase in the export of manufactured goods indicates the growing popularity of Canadian products in other countries.

It must be borne in mind that foreign trade is subject to fluctuations which it is impossible to control and difficult to explain. From these variations Canada suffers probably less than any other commercial country in the world, and the steady and rapid increase of her business in the world market and the infrequency and small importance of the periodical reactions are the outstanding features which prove the stability of her commerce and guarantee her advancement in the years to come.

The value of electrical apparatus imported during the twelve months ending March 31, 1911, was $5,128,682, as compared with $3,759,538 in the previous year. Of this total $4,577,075 went to the United States and only $392,852 to England.

Exports of aluminum amounted to $906,976, as compared with $1,202,741 the previous year; copper exports $5,575,033, as compared with $6,023,925. A decrease in each case, due, no doubt, chiefly to the increased home demand for both. This is borne out by the item of increased copper imports from $3,188,260 in 1909 to $4,384,329 in 1910.

30,000 H.P. for Prince Rupert

The Prince Rupert Hydro-electric Company, Limited, has been organized under the Companies Act, Canada, for the purpose of developing hydro-electric power and supplying electric energy for light, heat and motive power to the city of Prince Rupert, B.C., and to the settlements and industries in that vicinity. The company has acquired the control of the Tsimpsean Light and Power Company and of the Continental Power Company, Limited, and the water rights on the Khtada and Falls Rivers, branches of the Skeena River, which were formerly controlled by these two companies. These water powers, which are located approximately forty-two miles from Prince Rupert, are capable of developing at least 25,000 to 30,000 horse power of electric energy. It is proposed to develop approximately 1,500 horse power of electric energy by means of a provisional power plant to supply the immediate demands of the city of Prince Rupert; and to proceed to the construction of a permanent installation capable of supplying 15,000 horse power to be completed within three years, or so soon as the Grand Trunk Pacific Railway shall be completed to the Pacific coast. This plant will be extended and its capacity increased from time to time as the demand for electric energy increases at Prince Rupert and along the main transmission line of the company in the vicinity of the Skeena river.

The first proposed power site, at tide water on the Khtada river, is fifteen miles above Port Essington and opposite to Mile No. 42 on the Grand Trunk Pacific Railway. As the Skeena river is always open and navigable up to the Khtada, there is cheap water carriage for all machinery and materials up to the power house site. The Khtada river drains a watershed of approximately forty-five square miles, over which the precipitation of rain averages from eight to twelve feet annually, and flows into the Upper Lake, about six miles in length, and thence through a muskeg swamp to the Lower Lake, which is about three-fourths of a mile in length; and thence, in a distance of one and a half miles, it falls from an elevation of about 340 feet to the site of the proposed power house at tide water. These two lakes will form excellent storage reservoirs. The mean flow of the Khtada river is estimated to develop for commercial purposes from 15,000 to 20,000 electrical horse power. The transmission line will cross the Skeena river, which is not more than one-quarter of a mile in width, opposite the power site, and will follow the general route of the Grand Trunk Pacific Railway into Prince Rupert. It is estimated that the development can be made at a cost of about $135 per horse power, including the transmission line to Prince Rupert, and the receiving station there.

The company also proposes to install and operate a gas producing plant in the city of Prince Rupert, capable of supplying 75,000,000 cubic feet of gas per annum for light and heating purposes, increasing the capacity of the plant as the demand may necessitate.

The directors include the following: C. H. Cahan, R. Brutinel, L. A. Herdt, R. F. Haywood, H. A. Lovett.

Porcupine Power Company Operating

The hydro-electric power plant of the Porcupine Power Company at Sandy Falls on the Mattagami river was placed in operation during the first week in June. The initial construction is for an output of 3000 h.p. under a working head of 39 feet. It is only about four months since construction operations were commenced on this plant which, considering the semi arctic temperature prevailing and the distance from a railway station, might well be considered as constituting a record.

The dam is of timber crib, rock filled construction with nine 16 ft. x 16 ft. sluices and a spillway section 300 x 3 ft. for carrying off the flood water. This year the water rose during the flood, on the sluices, a distance of 10 feet. Minimum flow of the river at this point is in the neighborhood of 1,400 second feet. Storage capacity has been arranged for 500 second feet for one week continuous running. The flume 13 ft. x 16 ft. is of very heavy timber construction, and is lined with 2 in. matched spruce and pine. Power house is 132 ft. x 42 ft. x 25 ft. high. It is built of timber and corrugated iron. Arrangements have been made, when it is possible to get in cement more cheaply, to replace timber with concrete construction. A 30,000 lb. Advance Machine Company crane is in operation, and has been used to erect turbines and generators. Turbines are of S. Morgan Smith Company, of York, Pa., make, and generators were made by the Canadian Westinghouse Company. Extra large Lombard governors supplied with pumps of double size required by the manufacturers are used. Right of way is cleared and the transmission line completed as far as the Hollinger. Poles for transmission line are 10 in. in diameter at the small end, and carry two 5 in. x 6 in. cross arms carrying six No. 0000 aluminum cables, manufactured by the Northern Aluminum Company. All machinery is installed up to 3,000 h.p. capacity.

The plant was designed and built by H. D. Symmes, consulting electrical engineer, with J. H. Thornley as engineer-in-charge. The money was furnished for this enterprise by the Alpha Mining Company, consisting of John McMartin, Duncan McMartin, Henry Timmins, Noah Timmins, D. A. Dunlap and H. D. Symmes.

Winnipeg Municipal Plant for May

The following extract, taken from the monthly report of the construction engineers, Messrs. Smith, Kerry & Chace, indicates the progress of Winnipeg's municipal hydro-electric installation during the month of May:

"Messrs. Jens Orten-Boving & Company have all the principal portions of turbines 1, 2 and 3 in place, including the wall frame, and have made a good start on No. 5, and are beginning the assembly of No. 4. Part of the governor for No. 2 is in place. The draft ring for No. 2 is grouted.

"Messrs. Vickers Sons & Maxim have completed the assembly of stator for generator No. 2; have placed the bedplate for generator No. 1; have assembled the shaft and rotors for No. 1. No. 3 generator has passed satisfactory test in England and we believe it has been shipped. Material for the correction of poles of generators No. 1 and 2 is also being shipped so that these may be put in order at Point du Bois.

"Canadian Westinghouse Company placed all the switches in low tension switch room No. 1 and made good progress in the high tension wiring; they have the pedestals in position on the control gallery for generator banks Nos. 1 and 2.

"Canadian General Electric Company have made satisfactory progress in the placing of conduit and have drawn into the conduit a considerable quantity of smaller wiring.

"Canada Foundry Company have promised to ship at once the gate stems and the operating mechanism for the head gates, also the air compressor and the operating mechanism for the stop logs in the waste sluices at the intake.

"The Williamson Construction Company have completed the stringing of cables as far as tower No. 2; have completed the grouting of footings from Point du Bois to Lac du Bonnet and should shortly finish the remainder of this work at Milner Hill, west of which point it is completed.

"Messrs. Chapman & Walker, through their sub-contractors, Messrs. Rice, Greene & Company, have made fair

progress in the installation of the light, heat and power system in the terminal station.

"Canadian British Insulated Company have received their cable in Winnipeg, most of which was found in good order. They have ordered the lengths of cable to take the place of those which had been condemned on account of injury during transit.

"70,000 duct feet of conduit for the city distribution system have been received from the H. B. Camp Company, who are sending it forward at the rate of about one carload per day. A start has been made by G. M. Gest on the laying of conduit on King, McDermot and Notre Dame."

Lethbridge Extending Motor Load

The Lethbridge Sash and Door Company recently discovered that the engine and boiler that formerly operated their planing mill were getting too small for the rapid expansion of their business. They therefore decided to install a 75 h.p. motor to operate the whole of their equipment. The motor is 2,200 volt, 2-phase, 60 cycle, 900 r.p.m., squirrel-cage type, manufactured by the Canadian General Electric Company, and connected to the line through a starting compensator. The installation was made by the city electric department, 4-conductor, 3,000 volt, lead-covered cable, with Bell ends being used. The company have increased their output five per cent. owing to the motor maintaining a constant speed. The complete installation, including motor and compensator, was made at a cost of $900. Current is being sold for this motor at city's ordinary rate of $28 per h.p. per year, with the customary ten per cent. discount.

The Lethbridge Iron Works have also recently replaced their steam engine with motors totalling 70 h.p. Current is being sold to the Iron Works on a meter basis of four cents per kw.h. with the customary ten per cent. discount.

Regarding the tungsten lamp situation, owing to the rapid expansion of the city and the consequent increase in the peak load, it is difficult to determine whether the load has dropped or not. However, it is very noticeable that a much higher illumination standard has been set since the advent of the tungsten lamp and consequently in a large majority of the stores, while they are now brilliantly lighted, the bills remain about the same. Also, since the current has been on for the whole twenty-four hours in the residential district, a great many electrical heating devices have been sold and the increase in the day load is quite appreciable.

On the 18th of May the citizens voted on seven different money by-laws, totalling $491,000, all passing with large majorities. Consequently a start has been made towards getting out plans and specifications for extensions to the power plant and street railway equipment. It is expected the city will be in a position to call for tenders for these in three or four months. Mr. Arthur Reid is superintendent engineer for this rapidly growing city

Amendment to Rules

The Board of Railway Commissioners for Canada have approved the following amendment to the "Rules for Wires Crossing Railways and other Wires."

"An order of the Board shall not be required in cases in which wires or other conductors for the transmission of electrical energy are to be erected or maintained over or under a railway, or over or under wires or other conductors for the transmission of electrical energy with the consent of the railway company or the company owning or controling such last mentioned wires or conductors, in accordance with any general regulations, plans or specifications adopted or approved by the Board for such purpose."

Hydro rates for City of Toronto

The rates to be charged the light and power users of Toronto under the schedule of rates just published by the city's hydro-electric department are given below. Though too early to form a judgment as to how this will figure out in comparison with the past rates of the private companies, there does not seem to be any doubt that in certain cases it will mean a reduction. The fixed charge is always a difficult one to justify, however, especially with the small consumer.

Alternating Current

Residence Service.—A monthly service charge of four cents per hundred square feet of floor area, plus an energy charge of three cents per kilowatt hour. Subject to a discount of 10 per cent. for prompt payment. Term of agreement one year.

Commercial Lighting, 115-230 Volts.—Eight cents per kilowatt hour for the first thirty hours' monthly use of the maximum demand; all excess at three cents per kilowatt hour. 10 per cent. discount for prompt payment under one year agreement; 15 per cent. discount for prompt payment under three year agreement; 20 per cent. discount for prompt payment under five year agreement. Minimum monthly bill, $1.00 net for each kilowatt of maximum demand.

Commercial Power, Three-Phase, 25 Cycles, 550 Volts.—A service charge of $1.35 per month per horse power of maximum demand for the first ten horse power; all excess at $1.00 per horse power of maximum demand; plus an energy charge of 1½ cents per kilowatt hour for the first fifty hours' monthly use of the maximum demand; one cent. per kilowatt hour for the next succeeding fifty hours' use; and one-half cent per kilowatt hour for all excess. 10 per cent. discount for prompt payment under one year agreement; 15 per cent. discount for prompt payment under three year agreement; 20 per cent. discount for prompt payment under five year agreement.

Direct Current

In certain confined limits, direct current will be furnished at a potential of 120-240 volts under the following rates. Where direct current is supplied, a storage battery is used in connection with same as a standby, ensuring continuity of service.

Direct Current Lighting.—Ten cents per kilowatt hour for the first thirty hours' monthly use of the maximum demand; all excess at four cents per kilowatt hour. 10 per cent. discount for prompt payment under one year agreement; 15 per cent. discount for prompt payment under three year agreement; 20 per cent. discount for prompt payment under five year agreement. Minimum monthly bill $1.00 net for each kilowatt of maximum demand.

Direct Current Power.—A service charge of $1.35 per month per horse power of maximum demand for the first ten horse power; all excess at $1.00 per horse power of maximum demand; plus an energy charge of 2½ cents per kilowatt hour for the first fifty hours' monthly use of the maximum demand; 1½ cents per kilowatt hour for the next succeeding fifty hours' use; and three-fourths cents. per kilowatt hour for all excess.

The Kaministiquia Power Company, of Kakabeka Falls, has recently installed a system of reverse current selective type relays for protection of their sub-station apparatus. Similar installations are giving satisfactory results on the Shawinigan Water & Power Company's system.

C. E. A. Convention

The program of papers to be presented at the annual meeting of the Canadian Electrical Association at Niagara Falls, Ont., on June 21, 22 and 23, follows, and, with the addition of a number of reports of committees to be presented, promises a busy three days' work. Special attention is called to the fact that the business sessions each day will start at 9.30 sharp.

Business and Technical Sessions

The business sessions will start each day at 9.30 a.m. sharp. In addition to reports of committees, the papers to be presented will include the following:—

"Ornamental Street Lighting," by Mr. T. F. Kelly, chief contract agent, Hamilton Electric Light & Power Company.

"Customers' Terminals," by Mr. George S. Smith, The New York Edison Company, New York.

"General Accounting," by Mr. C. E. Bowden, auditor, Toronto Electric Light Company.

"Relations of Public Service Companies to the Public," by Mr. B. G. MacNabb, new business manager, Montreal Electric Light & Power Company.

"New Business," by Mr. Parker H. Kemble, general sales manager, Toronto Electric Light Company.

"Some Recent Developments in Electric Heating and Cooking Devices," by Mr. Roderick J. Parke, Toronto.

"The Advantages of Publicity to the Central Station Industry, by Mr. Glenn Harston, Chicago, Ill.

"Operating Safeguards," by Mr. E. Little, operating superintendent, Kaministiquia Power Company, Fort William, Ont.

"The Incandescent Lamp and Its Circuit," by Mr. Ralph Beman, National Electric Lamp Association, Cleveland, Ohio.

"Some Points on Central Station Management," by Mr. Wills MacLachlan, Trenton Electric & Water Company, Belleville, Ont.

"The Importance of the Use of Potential Regulators on Distributing Systems," by Mr. C. E. Allen, Westinghouse Electric Manufacturing Company, Pittsburg, Pa.

"The Importance of Co-operation between the Central Stations and the Electrical Manufacturers," by Mr. C. F. Scott, Westinghouse Electric Manufacturing Company, Pittsburgh, Pa.

Canadian Light & Power Will Operate July 1

On Thursday, May 18th, Mr. E. A. Robert, vice-president of the Canadian Light & Power Company, accompanied by a number of directors, shareholders, friends, and newspaper men, went to St. Timothee to inspect the company's power plant which is now nearing completion. It is anticipated that by July 1 the company will be delivering electrical energy in Montreal; that within two months the company will be sending ten thousand horse power into this city and by the end of the present year 25,000 horse power will be coming over the transmission wires from St. Timothee to Montreal. The power house is 180 feet long, 150 feet wide, and 80 feet high. It is constructed throughout of steel and concrete. It comprises the generating room, turbine room, transformer room, and operating gallery besides repair shop and general offices. Three immense wheels have been installed at the power house, one generator is practically completed, another is in progress of construction, and the third has been ordered. As soon as switchboard, conduits, piping, and connecting apparatus shall have been installed the company will be ready to offer power to Montreal consumers. The transmission line towers between St. Timothee and Montreal will number about three hundred, most of which are in place. The stringing of the wires is being proceeded with as rapidly as possible and will be completed within a few weeks.

About $4,000,000 has been spent already by the company in connection with this installation and it is stated that they employ about a thousand workmen. The present equipment of the company provides for the erection of four units with an aggregate capacity of 30,600 h.p. Three of these units will be in operation by September 1st and arrangements have been made to install six more when required.

The Canadian Light & Power Company has purchased the plant of the Central Heat, Light & Power Company,

Rear view of gate piers, Canadian Light & Power Co.

which was organized some years ago by the late Mr. Samuel Carsley. The price paid for the plant is said to have been about half a million dollars. As the territory served by the Central Heat, Light & Power Company is in the centre of the business district of the city of Montreal, it will be seen that the Canadian company has secured possession of a valuable asset and that the location possesses strategic advantages of great value. This gives the Canadian Company an immediate outlet for the power which they will shortly have to distribute from their Valleyfield plant and it is expected that the number of patrons the new company will serve will be increased as soon as the new supply of power is available. The Central Company was a very prosperous concern, serving a large number of customers within a radius of about a mile of the post office.

The complete electrical equipment was built by Allis-Chalmers-Bullock, Limited, of Montreal. It includes three water wheel type alternating current generators, each 5,000 kw., 3-phase, 60 cycle, 2,300 volts, 150 r.p.m., and two d.c. exciter generators, each 250 kw., 500 r.p.m. and one booster set, 60 kw., 850 r.p.m.; also three oil insulated water cooled step up transformers, each 5,000 kw., 3-phase, 60 cycle, 2,300 to 44,000 volts. The same company also supplied the 1,500 kw. turbo generator in the sub-station.

Turbines for the Town of Magog

The Escher Wyss & Company, Zurich, Switzerland, Canadian Head Office, Lumsden Building, Toronto, has recently secured the order for two water turbines of the double Francis type, designed for developing 850 h.p. under a head of 20 feet, and running at a speed of 150 r.p.m. for the town of Magog. The same company has also secured the order for two oil pressure governors of Escher Wyss & Company's own design, to be connected to the above turbines.

Annual Report Montreal L. H. & P. Co.

The annual statement of the Montreal Light, Heat & Power Company shows gross earnings for the year ending April 30, 1911, of $4,404,126, as compared with $4,240,945 in 1910, and $4,079,769 in 1909. Net earnings for the same period have been $2,104,287, $1,911,200, and $1,745,847. Out of the past year's net earnings contingent account gets $200,000, depreciation and renewal reserve account $266,000, and pension fund $10,000. The balance of $353,275 is carried to surplus account, which now totals $2,395,837. The liabilities of the company are placed at $32,142,188, the chief items being capital stock $17,000,000 and bonds $10,100,000.

The annual report also states that a contract with the Shawinigan Water and Power Company for an additional 40,000 h.p. was concluded during the year on a very favorable basis, in order to supply which that company has in course of installation a large independent extension to its hydraulic plant at Shawinigan Falls, of a capacity of 75,000 h.p., together with an entirely new transmission system of steel construction with auxiliary lines for emergency purposes, and a new independent terminal station of modern construction in Maisonneuve. With this augmentation of Shawinigan power, the Montreal L. H. & P. Company has under contract and available from that source 63,000 h.p.

The directors of the company are: H. S. Holt, president; Rodolphe Forget; vice-president; Hon. Robert Mackay; Sir H. Montague Allan; C. R. Hosmer; Hon. H. B. Rainville; Geo. Caverhill; J. E. Aldred; Hon. Narcisse Perodeau. J. S. Norris is general manager and secretary-treasurer.

Montreal Street Railway Company Increases Wages

The management of the Montreal Street Railway Company recently advanced the wages of their employees one cent an hour. In future a new man starting work will be paid 20 cents an hour. Those who have been with the company for three years will be paid 21 cents, while the maximum of 22 cents an hour will be paid after five years' service. About 2,500 men will be affected by the increases, which will total about $35 a year for each man. Free uniforms are given after three years' service, which, with other advantages granted by the company, will make the income of the employees equivalent to that of employees on American street railway companies, the cost of living being considered. The extra amount which this increase will take out of the company's funds will be between $75,000 and $100,000 per annum. The increase was made by the company without solicitation of any kind on the part of the employees. Moreover, the company have recently spent $100,000 to make the three recreation rooms placed at the disposal of the employees more comfortable and attractive. These rooms have been refurnished and supplied with music, billiard tables, and other forms of entertainment. On the initiative of the company, a sick benefit and insurance fund was started a few years ago, into which the men pay 50 cents a month, the company adding 50 per cent. to the revenue derived from the fees of the employees. There is also a pension fund for all who have served 25 years.

Montreal Notes

Crossed wires caused a short circuit that set fire to the junction boxes on the roof of the head office of the Great North Western Telegraph Company, St. Sacrament street, Montreal, recently and in a few minutes all the company's wires in the city were dead. The fire spread to the frame work on which the boxes stood. Spectators thought by the blaze which resulted that the building was on fire and that the flames were shooting up through the roof. The firemen were called and it took them only about two minutes to extinguish the blaze. The wires were considerably twisted and burned and it took the repair men a few hours to get everything in working order again. The accident occurred about one o'clock in the morning but the business of the next day was only slightly interfered with.

The latest type of sleeping car turned out for the Grand Trunk Pacific Railway has been equipped with electric light as the illuminant. There are two electric lamps in each upper and lower berth. One of the cars so fitted up is the "Australia," which will run between Winnipeg and Edmonton. Its sister cars will be named after other colonies in the British Empire.

Of the large number of arc lights formerly employed in lighting the wharf sheds in the Montreal harbor, ninety per cent. have been replaced by tungsten clusters.

The St. Lawrence Flour Mills Company, Limited, of Montreal, are having their electrical apparatus installed by Messrs. Barnett, McQueen & Co., of Minneapolis, Minn.

4,000 Horsepower Development on Otonabee River

Announcement has been made that the Otonabee Power Company will spend some $200,000 in increasing its installation on the Otonabee river to the full capacity of 4,000 horsepower. The location of the plant will be in the neighborhood of dam No. 5, on the Otonabee river. It is understood that the plan of development includes the utilization of dams No. 4 and 5, the water to be carried from above No. 4 by a headrace to the power house which will be situated just below No. 5. A considerable area of land has been acquired by the company at this point for the construction of the development works. This announcement follows the company's decision not to accept the offer to purchase made by the city of Peterboro. The company offers power to the city at $15 for 500 h.p.

Tungsten in Nova Scotia

At Scheelite, on Moose River, continuous operations have been carried on since March 4, 1910, in connection with the tungsten-bearing veins discovered in the fall of 1907. To date nine shafts have been sunk. They range in depth from 30 to 120 feet, and explore six scheelite-bearing veins. From this work, roughly 75 tons of ore have been recovered, which have not yet been treated. Development work has not reached a stage where definite conclusions as to the extent or value of the ore can be arrived at. Enough has been done, however, to show that the deposit is an important one. More recently a new vein of ore rich in tungsten has been uncovered; it is 4 inches in width. The owners believe it to be the richest tungsten mine in the world. At the present time the mines in the district referred to are being worked by a syndicate; but a company called the Scheelite Mines (Ltd.), with a capital of $3,000,000, has just received a charter to work them. It is expected that operations under the new charter will commence in February, 1912.

Sons of Jove Rejuvenation

Mr. George C. Rough, Jovian Statesman for Canada, announces that a Rejuvenation will be held at the Clifton House, Niagara Falls, Ontario, on June 23rd, which is the last day of the Convention of the C. E. A. He asks the support of the members towards the success of the event.

The Makers of Electrical Canada—7

J. J. WRIGHT — PIONEER

In the year 1881, in a little back room loaned for the purpose, by the Firstbrook Box Factory, on King street, Toronto, the first Canadian-made electric generator was in process of construction. It was a big generator in those days, though only a twenty-five horse power. The generator completed, a set of arc lamps of a primeval type were constructed and this apparatus was installed near the northeast corner of King and Yonge streets. The twenty lamps were placed in various stores on Yonge street, the late Timothy Eaton being one of the first customers.

The building of the apparatus, its installation and the operation of this, the first electric lighting system in Canada, were the sole work of one man, a true pioneer in Canada's electrical development, Mr. J. J. Wright, recently resigned general manager of the Toronto Electric Light Company, now its second vice-president and general consulting engineer.

Mr. J. J. Wright

The success of this early enterprise was immediately followed by active competition from two other companies, the Toronto Electric Light Company, operating about 25 street lamps, and the Canadian Electric Light Company, of similar dimensions. These in 1883 were all "merged" under the common name The Toronto Electric Light Company, and Mr. Wright became general manager of the "octopus." At this date the extent of the lighting companies' operations did not exceed fifty arc lamps, incandescent lighting being then only in an embryonic state of development.

It was in the same year that Mr. Wright showed his undoubting confidence in another form of electrical activity. In 1883 he and Mr. Van Depoele had fitted up and exhibited during the annual Toronto Exhibition the first Canadian electric railway system. It was not an entire success the first year but in the following season, 1884, Mr. Wright secured an old Grand Trunk flat car, placed a 25 h.p. motor on it, belted the motor to the car axle and successfully operated a train of three coaches from the foot of Strachan avenue to the Exhibition Grounds. For three or four years, at the same season, this road continued to demonstrate the feasibility of electric railway operation. This was only three years after Siemens, in Germany, had experimented on the first public electric railway the world had ever seen.

In the meantime the Toronto Electric Light enterprise, under its able management, continued to advance with rapid strides. In 1885 the paid up capital of the company was less than $200,000, and the contract price with the city per light per annum was $226. In 1886 the price was reduced to $200. In 1891 capital was increased to $300,000, the price per light reduced to $108, and a dividend of 7 per cent. paid. In 1896 the capital was a million and a quarter and the price of lights was reduced to $75.

This latter increase in capital was the outcome of a further absorption by Mr. Wright's company. In 1889 the Incandescent Light Company had been formed. Although its operations did not cut into the field of the Toronto Electric Light Company, as the first confined its operations to house lighting, the latter to street and business lighting, it was felt after a few years of the double management, however, that the two companies might well be operated under one management, and again Mr. Wright assumed control of the operations of both. From that date to the present time the history of the company has been one of continued prosperity and usefulness until to-day the maximum demand aggregates 20,000 horse power, the equivalent of over 30 c.p. for each individual in greater Toronto.

In still one other notable respect Mr. Wright has shown his interest in Canadian electrical matters. He was one of the small group which in 1891 were instrumental in organizing the Canadian Electrical Association. His helpful assistance was shown by the fact that he was the association's first president, which office he held for several consecutive years. Throughout the whole life of this organization he has been a member of the managing committee, only relinquishing that office during the present year on the occasion of the affiliation of the Canadian society with the N. E. L. A.—an act with which he was not in accord.

Mr. Wright is English born, 1849, and educated, and first came to Canada in 1870. Through all the years of vigorous work his genial personality has remained an outstanding feature of his character. This may be because Mr. Wright has been blessed with a healthy hobby—enthusiastic enjoyment of all kinds of aquatic sport—so that there are few week-ends that do not find him "speeding across the bounding waves" of Lake Ontario, the central figure of a jolly party.

At 62 Mr. Wright is vigorous both in body and mind, and Electrical Canada congratulates him on the satisfaction with which he must review the last twenty-five years of electrical progress and his own part in its making.

Railway Troubles Due to Electrolysis

Electrolysis from Stray Currents Due to the Return Currents of Electric Railway System and How Best to Remedy It

L. A. Herdt, D.Sc.

It is almost the universal custom in electric railway systems to use the rails as the return circuit to the generating station. The conductivity of rails used in electric railway work if the rails were continuous would be very great, but on account of the rail joints it is necessary, in order to secure a circuit of high conductance, to bond the rails at the joints, and in many instances to reinforce this return circuit by return copper feeders also bonded to the track at different points of the system and connected to the generating station negative busbars. A carefully bonded track reinforced by return feeders is necessary to avoid electrolytic corrosion, by stray electric currents, to gas mains, water mains, lead covered electric cables and other underground metallic structures.

Ordinarily the size of the track rail is determined by physical rather than electrical conditions—that is, the principal factors are weight and speed of cars. Rails used in electric railway work weigh from 60 to 110 lbs. per yd. Taking the electrical resistance of ordinary steel rails at from 9 to 10 times that of copper—of equal area—a track system if it could be made continuous would offer a very low resistance path for the current.

As an instance, a double track of 70 lb. rail—if continuous—would be the equivalent of nearly 3½ million circular mil copper.

In order to utilize to the fullest extent the conductivity of the rail as a return circuit the resistance of the rail joints must be kept low by means of low resistance bonding, hence the need of bonds of good conductivity; bonds that will also maintain a low resistance contact under the constant pounding and changes of temperature that will exist under ordinary operating conditions.

Table I. gives readings of electrical conductivity of rails of different weights bonded with electrically brazed bonds. Their values will of course vary, depending upon the rail, as the impurities in the iron have a great influence on its electric conductivity.

Cause of Electrolysis

If the track returns are in bad condition, that is, if the rail conductance is low—the bonding being poor or not maintained in first-class condition—or again, if the rails are overloaded with current so that the drop of potential of the rail return is high, currents from the railway system will find their way back to the power house, leaking from the rails which are in contact with the ground to neighboring pipes and metallic construction in the ground that offer the least resistance to the flow.

These stray currents cause electrolytic action, that is, whenever current passes from a pipe or cable to ground or to another pipe or cable, corrosion of the metal is set up and holes and pittings are produced. This will result in the bursting and leakage of pipes and the destruction of the lead covering on telephone and other cables, rendering them useless. This corrosion may be very rapid and depends on the intensity of the stray currents passing through.

Electric railway companies have been slow to recognize their responsibilities in this matter. It is now generally admitted that these companies must adopt such methods of construction for their track returns as will minimize the danger. They should maintain the efficiency of such construction through systematic inspection and repair.

Experience has demonstrated that the proper method of preventing electrolysis is to reduce stray currents to a minimum, and that the remedial scheme used and advocated by some to bond the tracks with the water and gas pipes, although it may afford local protection, increases the amount of stray current and must not be encouraged. The cure for the electrolysis trouble should come from the electrical railway companies, as the owners of pipes, cables, etc., can do little, if anything, to protect their system from stray currents. The remedial means are simple enough if properly and intelligently applied.

1st. High conductance return circuit provided by good bonding of the rails and additional feeders.

2nd. Proper bonding and cross bonding work at all track intersections.

3rd. Sub-stations at different points of the railway system to limit the amount of current through the rails.

4th. Systematic inspection of track returns.

Rail Bonds

Of all the appliances used in electric traction the rail bond has been one which has given possibly the most trouble and to which little or no attention has been paid. Bonds are still in use composed of pieces of iron or copper wire crudely rivetted to the rails, making little or no electrical contact and are worse than useless.

It is not the purpose of this paper to advocate any particular type of bond. There are bonds now being used that make practically perfect and permanent electrical contact. A good bond should show a conductivity that will add to the resistance of the section of the rails an amount of not

Rail lb. per yd.	Area in Sq. Inches	Resistance Ohms ft.	2 Rails 2 No. 00 E.B. Bonds	2 Rails 2 No. 0000 E.B. Bonds	2 Rails 2 No. 0000 E.B. Bonds 1 No. 0000 Cable between tracks	2 Rails 2 No. 0000 E.B. Bonds 1 350,000 Cable	2 Rails 2 No. 0000 E.B. Bonds 1 500,000 Cable	Resist. of 2 No. 00 E.B. Bonds in ft. of Rail	Resist. of 2 No. 0000 E.B. Bonds in ft. of Rail
50	4.9	.00002010	.01027	.01016	.00857	.00766	.00695	1.31	.685
55	5.4	.00001825	.00934	.00935	.00797	.00720	.00656	1.45	.755
60	5.9	.00001665	.00854	.00844	.00731	.00666	.00610	1.58	.826
70	6.9	.00001459	.00741	.00731	.00646	.00594	.00549	1.83	.955
80	7.8	.00001250	.00647	.00637	.00570	.00530	.00495	2.11	1.10
90	8.8	.00001136	.00590	.00579	.00524	.00489	.00459	2.32	1.21
95	9.3	.00001075	.00559	.00549	.00498	.00468	.00439	2.46	1.28
100	9.8	.00001021	.00532	.00522	.00486	.00448	.00421	2.59	1.35

Resistance of 2 No. 00 Bonds = .0000264 ohms. Resistance of 2 No. 0000 Bonds = .00001375 ohms.

TABLE I

more than three to four feet of rail. All bonds whose resistance is greater than that of four feet should be replaced or improved. Track intersections should receive careful attention. Heavy bonding and cross bonding should be used so that little or no potential difference exists from one side of a crossing to the other.

Substations

A sub-station system of power distribution does away once and for all with electrolysis troubles. In large electric railway systems the current fed out by the stations reaches into ten thousands of amperes. In such cases it is practically impossible to provide a return circuit of sufficiently low resistance if such currents have to be returned to one station only, otherwise potential differences between pipes and rails will be set up, giving rise to stray current and electrolysis corrosion.

The writer knows of an electric railway system where even with very heavy return feeders connected to the rails at different points, the generating station being some 1,200 feet away from the nearest rail track a drop of potential of 12 volts was obtained between these tracks and the station, or a potential drop of one volt per 100 feet. The current to be returned being approximately 10,000 amperes at peak load the copper necessary to bring the voltage drop to some safe limit—say 3 volts in that distance would have cost, as it must necessarily have been placed underground, in the neighborhood of $35,000.

In a large number of cases which have come under the observation of the writer the electrolysis trouble is due to a concentration of current in the track near the station.

The current density in the track must be kept low, if electrolysis trouble is to be avoided. Substations equipped to feed from 2,000 to 3,000 kilowatts and placed at different points of the system will subdivide the current required for the operation of the cars. It will also improve the problem of distribution, giving better voltage and better service and will, as stated before, do away once and for all time with electrolytic troubles.

Electrolysis Investigation and Survey

In making an electrolysis survey of a piping system, potential differences between pipes, rails, telephones, cables, etc., should first be taken in order to locate the areas in which the stray currents flow between pipes and rails and between pipes and pipes. These readings are easily obtained by using a high resistance centre zero reading portable voltmeter. These readings should be marked upon a map of the city showing the general lay-out of the gas and water mains, and telephone cables. The lay-out of the tracks, showing size of rails, type of bonds and all negative copper supplementary to the rails should also be marked. The areas in which pipes assume positive potentials to the rails can be tinted red. These are the most dangerous districts—the stray currents flowing from the pipes through the intervening soil to the rails. These red districts will usually be found around the supply stations or at return feeder connections.

When rails assume positive potential to the pipes the districts where these occur can be painted blue. These are negative districts, current is entering pipes from rails.

The danger from electrolytic corrosion, although not as great as in the so-called positive districts, still exists in these areas as stray currents, flow in pipes along their length, or again flow from pipes to pipes, setting up corrosion by shunting across high resistance joints and at every point where it leaves the pipes for the ground.

Potential differences between pipes and rails are not sufficient to indicate the intensity of the stray currents. A high potential may possibly mean a high ground resistance, and only a small current flowing. To obtain the current flowing in the pipes it is necessary to make measurements of the drop of potential along these pipes. If the length and dimension of pipes in which the reading has been taken be known an approximation to the value of the current flowing can be calculated. These readings are also very useful in indicating the direction of the flow of the current.

An examination of the general condition of the track returns, return feeders, location of stations, demand of electric current, condition of the soil, run of the underground piping system and cables, will usually give very good indications as to the places where electrolytic corrosion due to stray currents is likely to exist.

It is the duty of traction interests to see that after the remedies cited above have been applied and the conditions obtained which show that electrolysis troubles are eliminated for the time being, such conditions be maintained. The track returns should be under test in order to remedy at once any faulty bonds as they appear. Accurate records of the potential difference of the track to ground at different points of the system should be kept on record. This will be found by the traction companies a wise and good financial policy.

Power Development at Niagara Falls

Total Installations of Approximately 400,000 Horse Power.—Scenic Beauty of River not yet Impaired.

There are five large development companies at Niagara Falls, three on the Canadian side, two on the United States side of the river. The three companies on the Canadian side are,—The Ontario Power Company, the Canadian Niagara Power Company and the Toronto Power Company. The power houses of the Niagara Falls Power Company and the Hydraulic Power Company are situated on the United States side of the river. The accompanying sketch map indicates their relative positions. The map shows, also, the location of the intake and of the water conduits of the Ontario Power Company, the canal which supplies the Hydraulic Power Company and the approximate location and points of exit of he discharge tunnels of the other three companies.

The total quantity of power apparatus installed by the five companies closely approximates four hundred thousand horse power and yet it is calculated that less than 4 per cent. of the total water flow is being utilized. A brief resume of each development follows:—

The Toronto Power Company

Organized in 1903 as the Electrical Development Company of Ontario, Limited. In 1908 together with the Niagara & Toronto Transmission Company, placed under the control of a holding company called the Toronto Power Company. The directors are Sir Wm. MacKenzie, president; Col. Sir Henry M. Pellatt, vice-president; Frederic Nicholls, James

Gunn, J. C. Grace. Robt. J. Fleming is general manager and Wm. B. Boyd chief engineer.

Four units are operated at present and the installation of three more will be completed before the end of the present year. The turbines are I. P. Morris manufacture double runner type; the generators are Canadian General Electric verticle type. The power is used chiefly to supply the demands of the Niagara, St. Catharines and Toronto Railway Company, the Toronto Railway Company and the Toronto Electric Light Company.

The Ontario Power Company

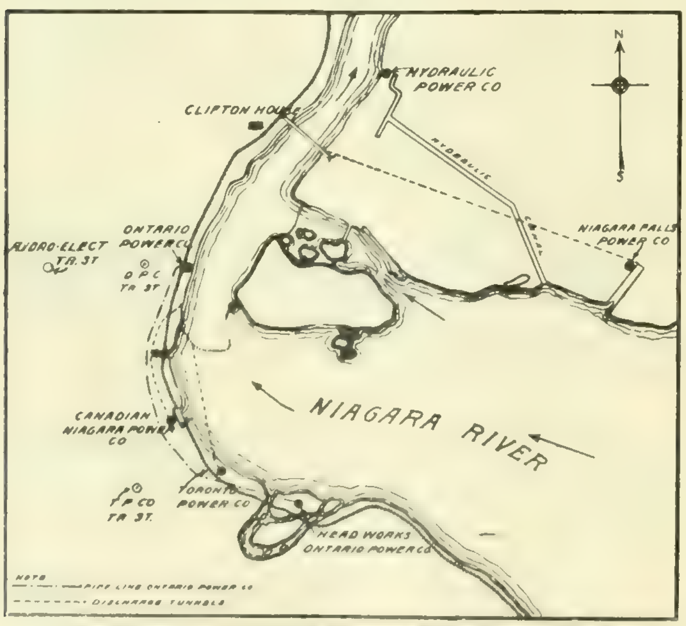
Charter first granted in 1887. Work of construction commenced in 1902; operating since 1905. Power is supplied in Ontario through the Hydro-Electric Power Commission of Ontario and through the Ontario Transmission Company. The latter, a subsidary of the Ontario Power Company, distributes power and light over the eastern end of the Niagara peninsula including St. Catharines, Thorold, Welland, Port Colborne, etc. In the United States the Niagara, Lockport and Ontario Power Company is the distributor. Lines run east as far as Syracuse. The total length of transmission lines fed by the Ontario Power Company's generators approximates seven hundred miles.

Ten units are operating, three additional units having recently been installed. The generators are horizontal type, the first seven Westinghouse, the last three Canadian General Electric manufacture. The turbines are all Voith manufacture double runner type.

The directors of the company are J. J. Albright, president; General Francis V. Greene, vice-president; Edward Hayes, S. M. Clement, W. H. Gratwich, R. K. Albright, W. A. Rogers, Miller Lash, R. C. Board. V. G. Converse is engineer in charge; H. H. Wilson, superintendent.

The Hydraulic Power Company

This is the original Niagara Falls Hydraulic Power and Manufacturing Company. Power is obtained from an open canal which passes through the centre of the town of Niagara Falls, N. Y. Work on this canal was begun in 1852 and completed in 1861. A head of 212 feet is available. The original power-house, called Station No. 1, was built in 1881 and only utilized a head of about 85 feet. Station No. 2 was commenced in 1895 and the full head was used. This station contains 32 electrical units varying from 1,000 kilowatts down mostly direct current.



Map Showing Location Niagara Falls Power Plants.

Station No. 3 was commenced in 1903. Ten units are now completely installed. The turbines are I. P. Morris manufacture, horizontal axis, spiral case type, 10,000 h.p. capacity. The first five electrical units installed in this station are direct current, General Electric manufacture, horizontal type. They are owned by the Aluminum Company of America who purchase power for their operation off the turbines of the Hydraulic Power Company. The second five units are a.c. Allis-Chalmers manufacture. These are owned by the Cliff Electrical Distributing Company, a subsidary of the Hydraulic Power Company. The Cliff Company also distribute the output of these five generators, chiefly among the factories of Niagara Falls, N. Y. No power is transmitted outside the city limits.

The directors of this company include Arthur Schoellkopf, J. S. Schoellkopf, Geo. B. Mathews, Paul A. Schoellkopf, and W. D. Olmsted. The chief engineer of both the Hydraulic Power and the Distributing Company is John L. Harper. Mr. Harper was also construction engineer of number three station.

The Niagara Falls Power Company

Power first delivered in 1895 from power house No. 1. The plant now consists of two power houses, No. 1 containing ten 5,000 h.p. units and No. 2 containing eleven 5,500 units. The turbines in No. 1 are Swiss design and I. P. Morris manufacture but are now in process of replacement by a design of the Niagara Falls Power Company's own engineers. The turbines in No. 2 are Escher Wyss design, also manufactured by the I. P. Morris Company. The generators in No. 1 are vertical type, revolving field, Westinghouse manufacture. The generators in No. 2 are General Electric. The capacity of this plant is placed at 110,000 horse power. Both these power houses are similar in design to that of the Canadian Niagara Power Company or to the Toronto Power Company.

A large percentage of the power developed is used locally by industries on the power company's own lands, the policy being to foster industries and so create a power market by offering special inducements in the way of factory sites. This is made possible by the company's ownership of large areas of land in the immediate vicinity of the power house. 22,000 volt lines also carry poper to Buffalo, Tonawanda, Lockport, Fort Erie, &c.

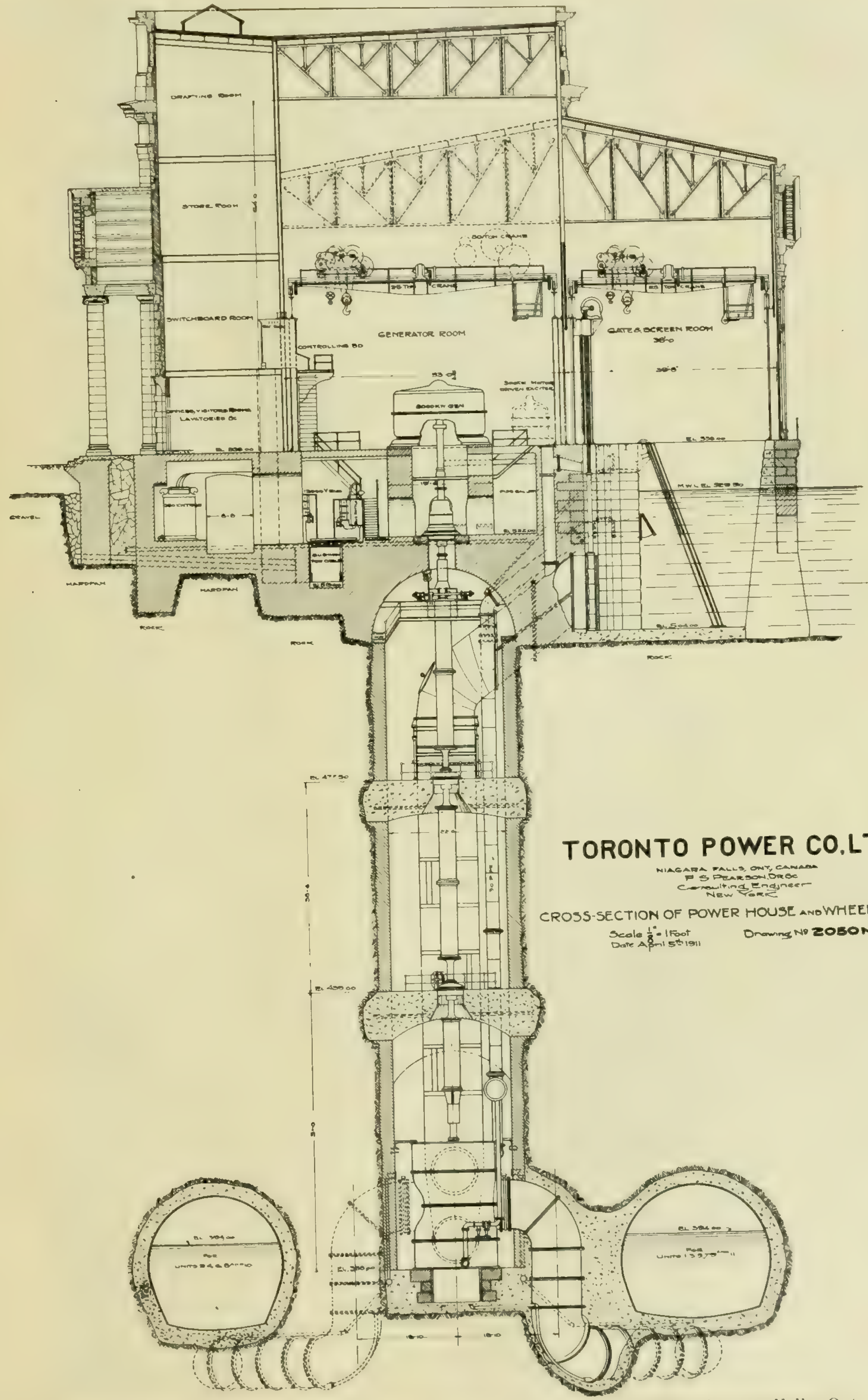
The directors of the company include E. A. Wicks, president, and Philip P. Barton, vice-president, and general manager. The superintendent of operation is L. E. Imlay with T. N. Hicks, assistant.

The Canadian Niagara Power Company

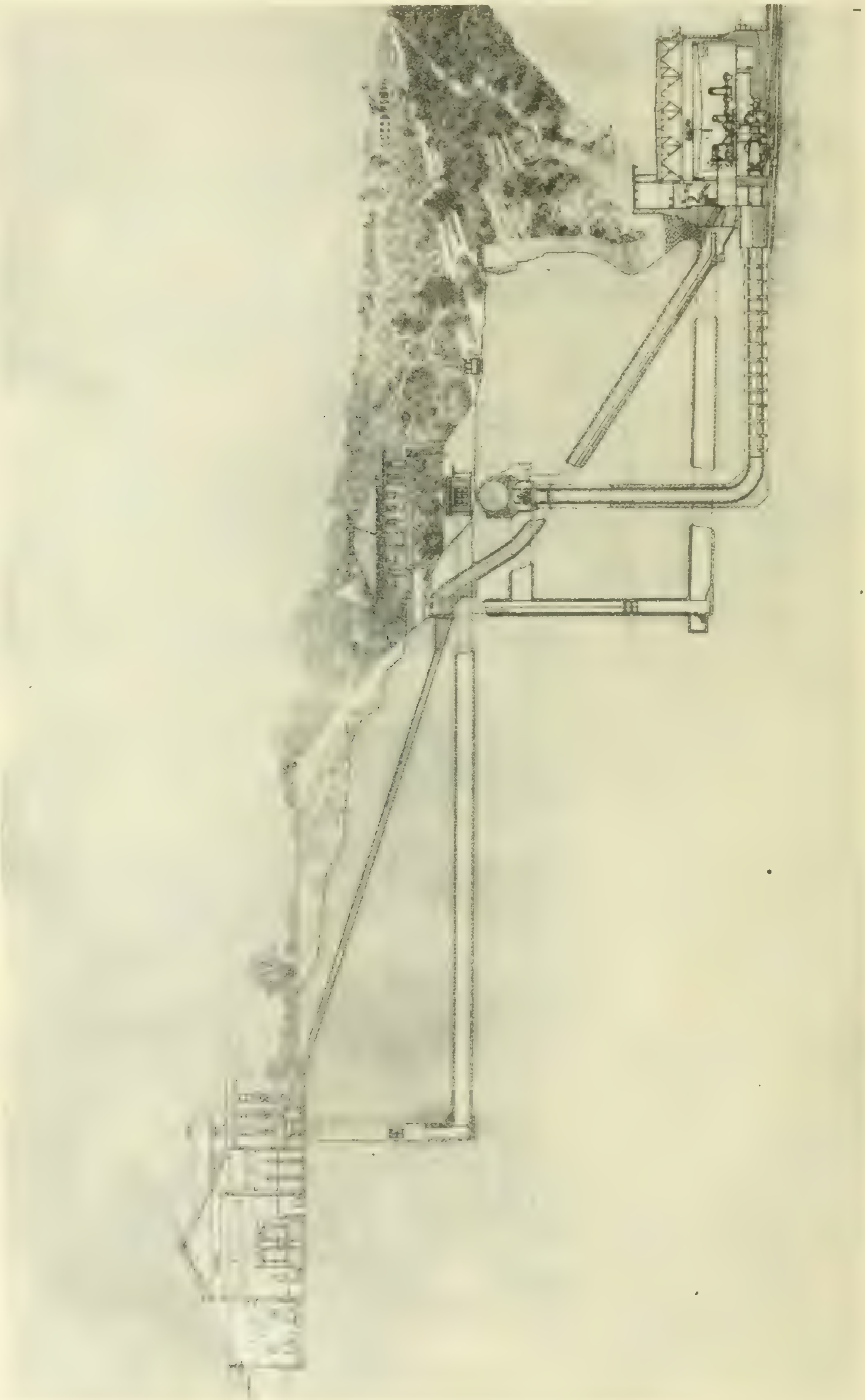
The first two units in this power house began operating in 1905. Up to the present time six units have been installed. The turbines are 10,000 h.p. capacity, Francis type, built by the Escher Wyss and I. P. Morris companies. The generators are internally revolving field type, vertical axis, General Electric manufacture. Five more units of the same capacity will be added.

This plant is interconnected with the Niagara Falls Power Company's two stations on the United States side of the river. A separate transmission line also leads along the Canadian side to Buffalo, and Fort Erie.

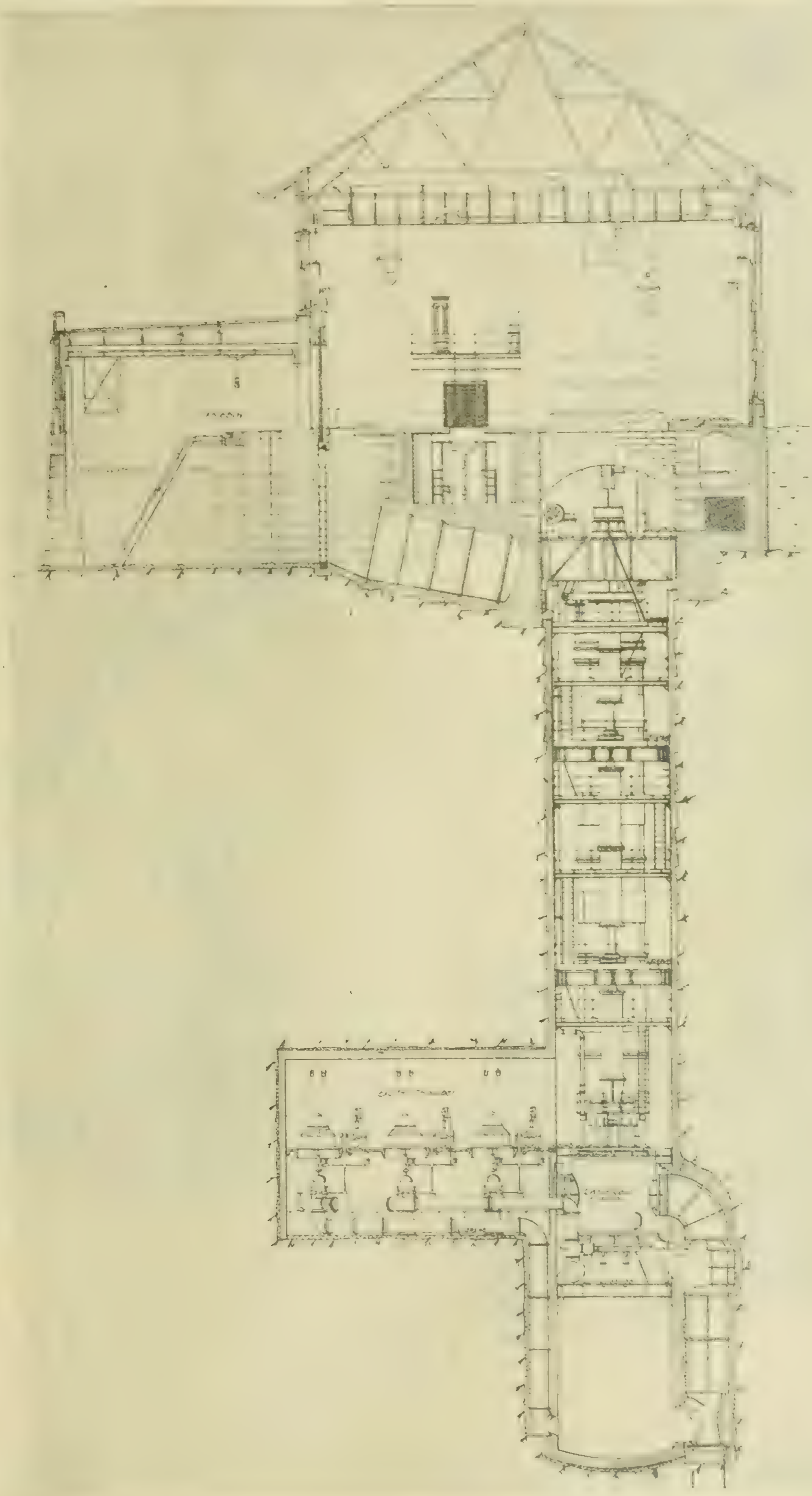
The directors of the company include W. H. Beatty, president; A. Munro Grier, vice-president; W. H. Brouse, Wallace Nesbitt, Delancey Rankine. The general manager and superintendent are the same as for the Niagara Falls Power Company, Philip P. Barton and L. E. Imlay. A. D. Robb is assistant superintendent.



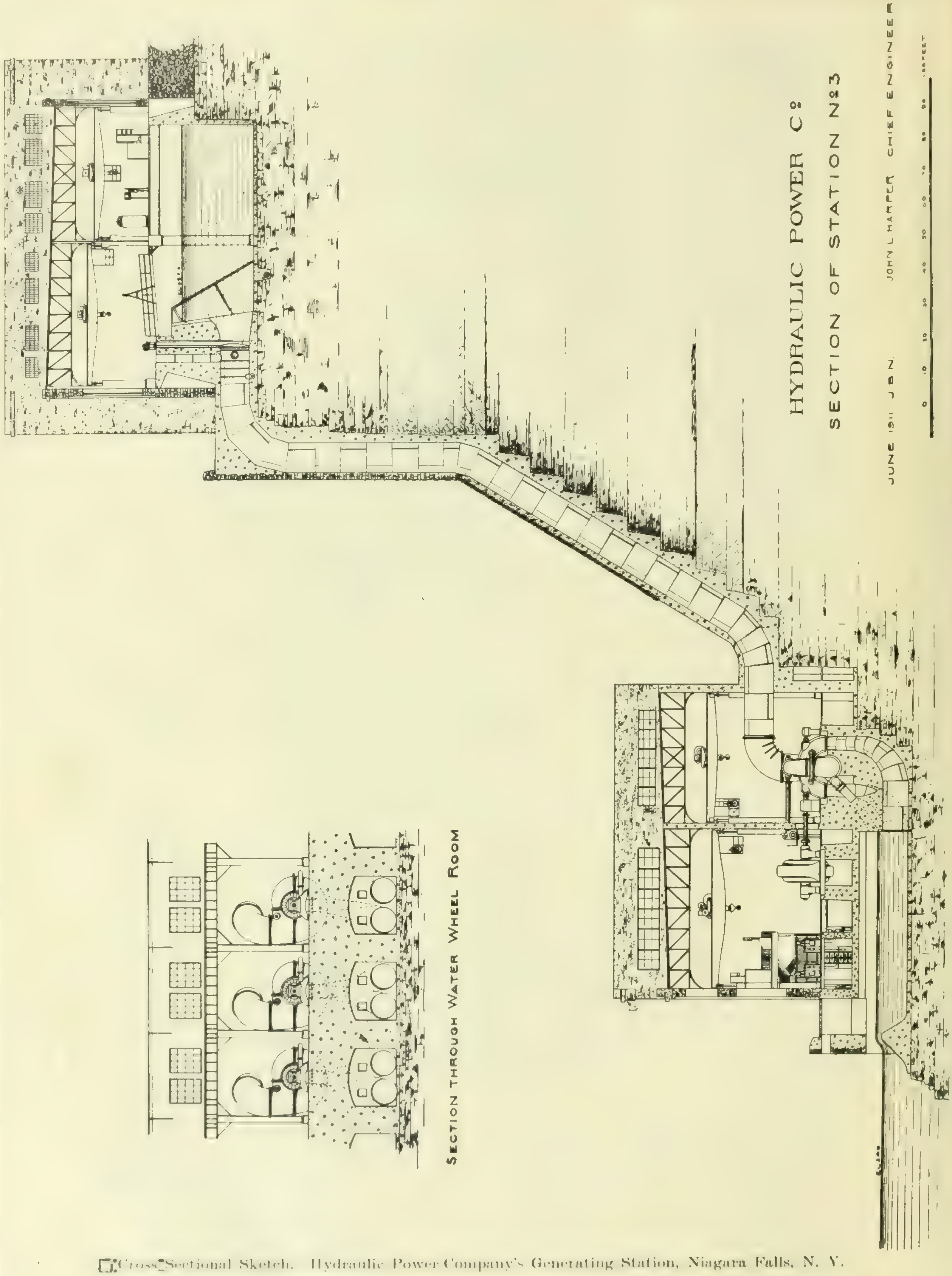
Cross Sectional Sketch, -Toronto Power Company's Generating Station, Niagara Falls, Ont.



Cross-Sectional Sketch Ontario Power Company's Generating Station, Niagara Falls, Ont.



Cross Sectional Sketch. Canadian Niagara Power Company's Generating Station, Niagaar Falls, Ont.



Cross-Sectional Sketch, Hydraulic Power Company's Generating Station, Niagara Falls, N. Y.

Application of Electricity to Mining

A Discussion of the Various Mining Operations Requiring Power and the Universal Applicability of Electricity to them

By C. H. Wright (Halifax)

The prime essentials for operating any mine are light, ventilation and power, all of which must be provided from an external source and mining on any scale cannot be done without a reliable supply of each of these. The problem of lighting has been solved to some extent by the standard miner's lamp, but in surface workings and some parts of the underground work, these are quite unreliable and for the illuminating of piers and shipping points, a modern form of illumination is absolutely necessary. The operation of ventilating fans calls for a number of power installations, which in a great many cases are very inefficient and inflexible. The demands for power in underground workings are increasing daily, and have called for designs embodying compressed-air, steam, electricity and animal power. It is a fortunate fact that electricity lends itself to the convenient and efficient operation of the above essentials.

The Lighting of Mines

The question of electric lighting does not need much discussion, as the use of the incandescent lamp in mining is very common for the lighting of large areas, surface workings and piers. The advent of the tungsten lamp and notably the series tungsten arrangement has enabled mine operators to introduce very efficient systems of lighting, which call for a minimum of repairs and attention. The series tungsten system has met with great favor in some of the Maritime provinces, the lamp itself being more than twice as effiicient as the ordinary carbon filament lamp, and requiring none of the attention and repairs that are called for by various types of arc lamps. Clusters of these new series tungsten lamps with hoods and suitable weatherproof fixtures have been found to be very satisfactory.

Electric Power Operations

The question of power for operation of the fans, hoists, pumps, locomotives, etc., is a much larger consideration.

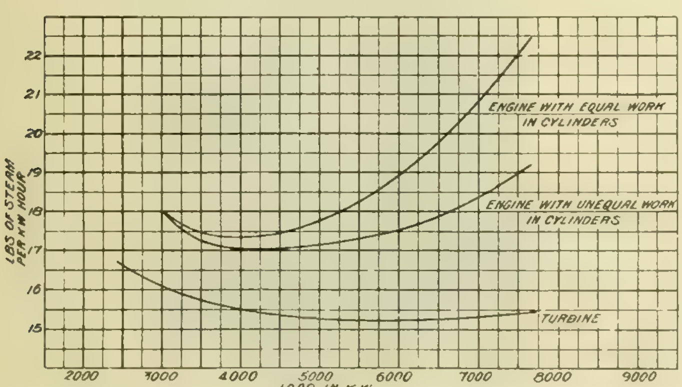


Fig. 1 Comparative Curves, Turbine and Engine Efficiencies

In many cases, there will be found in existing mines, numerous steam plants, with their acompanying boiler installations, and the inefficiency of such equipments considering the run of a total year is proverbial and one needs only to consult the cost charts to see how profits are diminished in this connection. It is a regrettable fact that the profits from a large number of our mines are altogether too small considering the enormous capital involved.

There is but little question that the salvation of some of the smaller mines is bound up with cheap power, and it would appear that the only solution of this problem is in large central power stations, transmitting and selling blocks of power to the distant and comparatively small power consumers. Such plants are already in operation in Nova Scotia, the Cobalt district of Ontario, and in British Columbia, but the importance of this system of power distribution and supply is not yet recognized as it should be.

This paper does not recommend the indiscriminate use of electricity in mining operations, but there is hardly any mining process that cannot be facilitated to a large extent by an electrical drive. The experience of mine operators has been such that we can now say how application should be made and the designs are such that satisfactory operation is assured from the outset. Some objections to all advances in any art will always be encountered, and in the case of electrical appliances, this has naturally been found to be true. The greatest success has been attained in those mines where the men have been trained and instructed in the handling and use of electricity, recognizing that it is a power calling for respectful attention and that neglect of obvious rules of safety gives trouble, and ends disastrously. It is, however, possible to install complete electrical equipments without increasing the hazard beyond that which obtains in other mining operations in our country to-day. All mining operations of magnitude involve danger and the extra risk from electrical installations is not above that of other power workings.

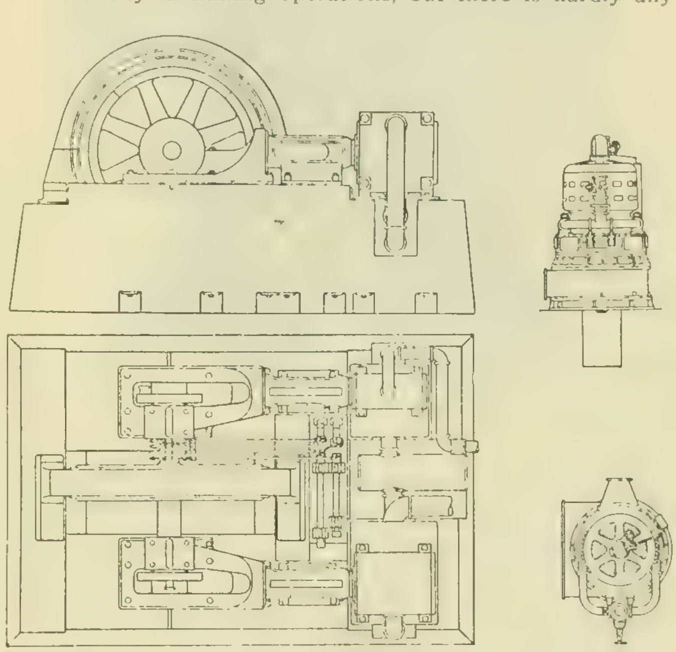


Fig. 2. Comparative Size Engine and Turbine Plants

Standardization of Rules

In view of the various methods of installation and different standards adopted throughout the United States, various attempts have been made to standardize rules of operation and safety precautions. It is well to consider this serious side of the problem, and the points of importance are dealt with in an exhaustive manner in a report recently issued by the American Bureau of Standards, No. 23, en-

titled "Standardization of Electrical Practice in Mines." The report includes various States of the Union, as well as the reports of England and various European countries. Owing to the manner in which this report was prepared and to the representative character of the members of the committee, it is especially valuable. The report recognizes the differences that have developed in various parts of the country, and shows how trouble is avoided, by the

Fig. 3. -Air Cooled Transformer

taking of practical precautions. The report is not yet a legal enactment, but no doubt it will influence legislation and will tend to standardize electrical designs by all prominent manufacturers. It will be to the advantage, therefore, of mining operators to study this phase of the question in order that their developments may be in line with the work of the fraternity throughout the world.

Electricity is used both direct and alternating at various pressures; low, 300 volts and under; medium, 300 to 600 volts; high, 600 to 3,000 volts; extra high, over 3,000 volts. The pressure to be chosen depends entirely upon the conditions, and the question of installation for the various pressures is also a particular problem. In gaseous coal mines, extra precautions are necessary and the location of electric apparatus fed by the higher voltages must be arranged in accordance with supplies of fresh air, etc. There are some places in mining operations where no insulation should be allowed whatever upon the wires, so that these conductors will be treated with the respect which they deserve; the deterioration of ordinary insulations overhead causes a needless risk.

Isolated Equipments Often Inefficient

Where there are a large number of isolated power equipments, many of these will be found operating at inefficient low loads, while others will be found to be overtaxed. By installing one large power plant, the load upon it can be maintained fairly constant which tends to efficiency, and besides a smaller total power equipment will be called for. The power generating units may be chosen in large sizes, cutting down the cost per unit of power, and giving much better efficiencies than is obtainable in smaller units. In this way reliability is secured, pressures are maintained constant, and bye-products may be used which are now being wasted in the various small plants. No better illustration of what can be done in the electrical distribution of power can be shown than in the modern electrical street railway, where one large and efficient power house distributes flexibly, and comparatively efficiently, power to a large number of small power consumers operated by unskilled help. The reliability of the modern street railway shows what can be obtained in this way. It is exceedingly encouraging to notice how mine operators and managers have been quick to adopt these new methods of transmission and operation. Many of the large mines in Nova Scotia are now electrically operated and others are changing from steam to electric control.

The Advantages of the Turbine

When a large power plant is undertaken for mining operations, the current used will almost certainly be three-phase, alternating current, 25 or 60 cycles, with slight variations either way. If steam is used for the prime movers, high pressure steam turbines working to a low vacuum would be installed, and a certain amount of superheat would likely be called for.

The efficiencies of turbines as compared with steam engines in large sizes is very apparent as seen in figure 1, which shows curves illustrating this comparison. Small units without superheat will call for about 21 lbs. of water per kilowatt hour output; under better conditions this may be decreased to 18 lbs. per kilowatt hour output of the generators. In larger turbines with higher pressure steam and without superheat, the water rate can be reduced to 15 lbs. per kilowatt hour output at the terminals of the generator, whereas, a reciprocating engine of this capacity will call for 17 to 20 lbs. at least per kilowatt hour output. The largest turbines with 200 lbs. gauge pressure, 125 degrees of superheat, and 29-in. vacuum, show water rates under 13 lbs. per kw.h. generator output and this is maintained throughout from large changes of load, a point of great importance in some plants.

When units of any considerable size are called for, the space and cost of reciprocating engine driven units make such an installation almost prohibitive. Fig. 2 shows comparative dimensions of 1,500 kw. Corliss engine and a 1,500 kw. vertical turbine; the advent of the steam turbine has

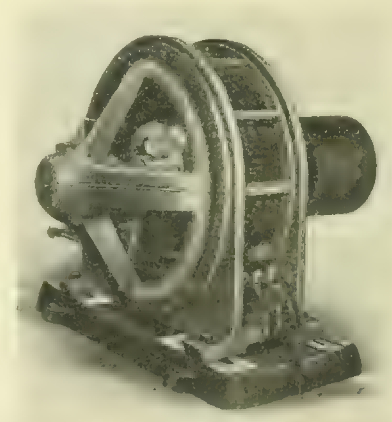


Fig. 4. Induction Motor.

entirely changed the art of power generation in steam plants.

In some places reciprocating steam engine units are already installed in central power plants, or there may be available large quantities of exhaust steam now being wasted. In this case, the steam may be taken slightly above atmospheric pressure and used through the low pressure turbine, which discharges into 28-in. vacuum. In the case of high pressure reciprocating engines, delivering, say, 1,000 B.h.p. when working on steam pressure of 150 lbs.

and exhausting into the air, another 1,000 h.p. can be obtained from the steam, approximately, by the use of the low pressure steam turbine connected to the engine exhaust, and this can be done without additional live steam capacity. In such an installation, provision is generally made for the use of some live steam in the low pressure turbines, in case the exhaust supply decreases. Many such plants are being installed in Canada to-day, and their satisfactory operation is guaranteed.

Water powers are of course a splendid form of prime supply, and a large water plant distributing power to various small mining plants would be a great boon to many of our properties. There is no doubt that if such power were made available in some sections of Nova Scotia it would mean a revival in some parts of the industry. In most water-power stations the electric generators are direct-connected to the water wheel shafts, and may be arranged either vertically or horizontal, and the power distributed through a switchboard at a pressure suitable for the work in hand. In some cases it is stepped up through transformers to higher pressures, and in other cases it is used at the same pressure as generated.

Gas Engines are Applicable

There are other forms of prime movers, too. In some cases gas engines are very applicable, but in many cases steam or water power will be found to be more suitable;

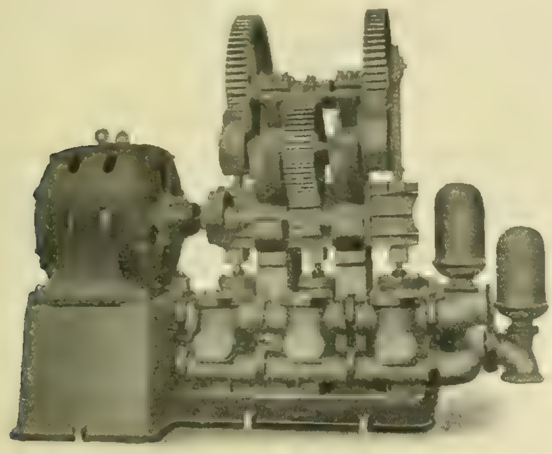


Fig. 5.—Motor Driven Plunge Pumps.

the economy of the gas engine per pound of coal is splendid, and when installed under proper conditions, it is a valuable asset for the generation of power.

If the power is to be carried to any distance, it is often necessary to generate at a comparatively low voltage, say 550 volts, three-phase, or 2,200 volts, three-phase, and step this up to a higher pressure through transformers. When the distance does not exceed 1½ miles 2,200 volts is very often satisfactory, and if the motors are close to the power house, 550 volts or 220 volts would be used. On account of easy conversion from low to high voltages and vice versa, alternating current is nearly always used in this class of work; direct current is sometimes used and mention will be made of its application later in the paper. At present in the province of Nova Scotia, various voltages are used, such as 220 volts and 550 volts, three-phase, on the motors proper, and 2,200 volts, 6,600 volts, and 22,000 volts are used on transmissions; voltages beyond these limits are used in the other provinces; these figures will serve as an indication of the pressures it is necessary to adopt under varying conditions.

The transformers for raising the voltage or reducing it may be either cooled with oil or air. In some cases it is necessary to introduce copper pipes to circulate water so as to keep the oil itself cool and radiate the heat generated inside the transformer; the cases are given a large area for the same purpose. Air cooled transformers are also used as shown in Fig. 3, the air being forced under pressure through ducts in the transformer core. The style of transformer chosen will depend upon conditions and costs; the

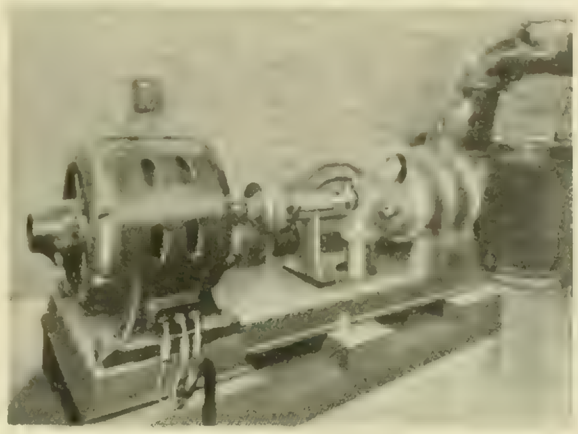


Fig. 6. Three Stage Turbine Pump

transformer itself in any case is a highly efficient piece of apparatus, and as a rule gives very little trouble.

Value of A.C. Induction Motor

In the application of electric power to the various drives required in a mine or any surface workings, we are particularly fortunate in having the alternating current induction motor. This is made in various styles, but the best known and most used type is the so-called squirrel-cage motor, which has no moving contacts or brushes, and carries no high voltage in the revolving part. Fig. 4 shows a motor of this kind. It is essentially a constant speed machine, started by an external compensator and can be made in various speeds, and to suit various conditions. If necessary these motors can be totally or semi-enclosed, but it is preferable to leave them open if at all possible, on account of heat radiation. A different style of this motor is made for variable speed, and in this case a controller is applicable. Such a machine is useful in connection with fans requiring adjustable speeds, or in connection with water or ore hoists, the control in that case being similar in operation to a street car with one motor. Induction motors can be built

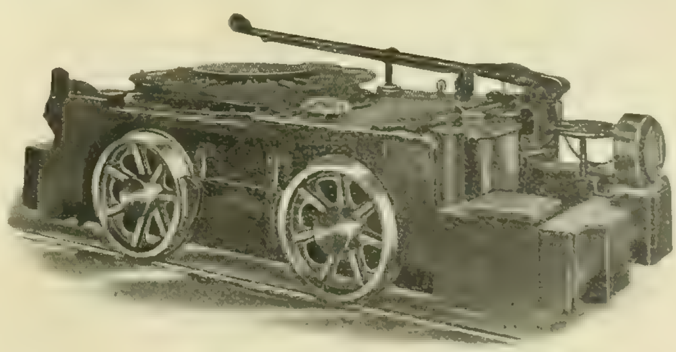


Fig. 7. -Electric Locomotive for Mine Operations

in large or small sizes. The induction motor is almost universally applicable to mine workings, although occasionally it is necessary to use the direct current motor, as where, in connection with variable speed hoists and electric locomotives, certain refinements of control and efficiencies of varying speeds call for this design. For the operation of fans, conveyors, and compressors, the constant speed squirrel-cage induction motor is generally chosen; a synchron

ous alternating current motor is sometimes chosen to improve electrical conditions on the line, and in the case of compressors running at a steady load or in any similar plant that can receive a fair amount of attention, the synchronous motor should be considered in order to improve the power factor and regulation of the entire plant. These motors can be designed to give satisfactory starting current and torque and are meeting with much favor from mine operators.

Pumping Outfits

In connection with mine operation, the question of pumping is of supreme importance. Plunger pumps as shown in Fig. 5 are sometimes geared to electric motors and under certain conditions they are the most satisfactory type; more and more attention, however, is now being paid by mine operators to the high grade turbine pumps now in the market; they are especially suitable for motor drive, as both parts are essentially revolving machines. Fig. 6 shows such a three stage turbine pump. As the design is made for very high speed and low or high heads, the equipment is light and small, lending itself to installation in pits, etc. At present there is under consideration for a Nova Scotia mine a turbine pump to deliver 800,000 gallons of water in twenty-four hours under a total head of 1,550 feet, the speed being about 1,400 r.p.m., the voltage 2,000, and the frequency 50 cycles, three-phase; power required being about 385 h.p. A similar pump will handle 800,000 gallons

Fig. 8.—Electric Train Emerging from Mine

of water under 1,040 feet head with the same electrical conditions. The turbo pump does not require attendance as does the plunger pump and if properly installed can operate on one lift or from one level where two plunger pumps would have to be installed at different levels, on account of the pressures involved.

Electric haulage of ore or hoisting of water calls for considerable attention and design. Electric locomotives can be used when the grade is not excessive. These are made in various weights and styles, and as a rule are operated by direct current, see Fig. 7. Occasionally where no trolley is available, a cable is carried by the locomotive when it leaves the main slope. Traction-reel types of locomotives are also supplied where necessary. On the surface, heavy electric locomotives can haul very large loads and these can be either alternating or direct current. Fig. 8 shows an electric train emerging, with direct current locomotive supplied by current from the trolley.

Where electricity is to replace large winding engine, the matter is more serious and the question of design must be carefully considered. In order to show a saving with electric hoisting over steam hoisting, it is necessary that there be a reduced consumption of coal under the boilers per ton of ore hoisted. It is often hard to get a statement that will take account of all the factors, but it is well known that the ordinary steam hoisting engine is a very inefficient device operating as it does at varying speeds and loads and its efficiency being under the control of an operator

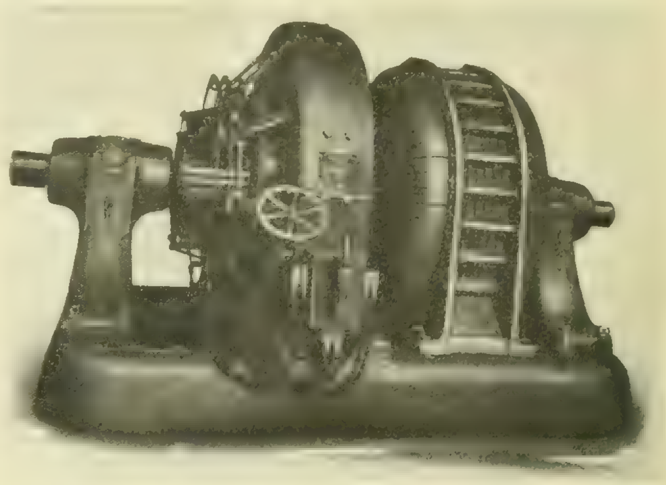


Fig. 9.—Motor Generator Set Changes A. C. to D. C.

who, as a rule, is unskilled. It is often impossible to take advantage of higher grade of steam hoisting engines on this account.

Characteristics of Load Vary

Where there are several winding engines fed by one central electric power station, it can easily be seen that the loads in different cases will so overlap that a comparatively even load will result upon the power house, with the added result that the boiler and engine capacity at that point is less than the aggregate of the individual plants. Again, as the power house units operate at better efficiency, economy can be shown in this connection. High pressures, superheat, and low vacuum can be introduced into one central power station where expert operators can pay attention to these details, which make definite savings in any plant. Electric hoisting has been thoroughly developed and is no longer a matter of experiment; it is necessary, however, to use that style of electric hoisting which is most suitable for particular conditions. In order to obtain variable speed and close control,

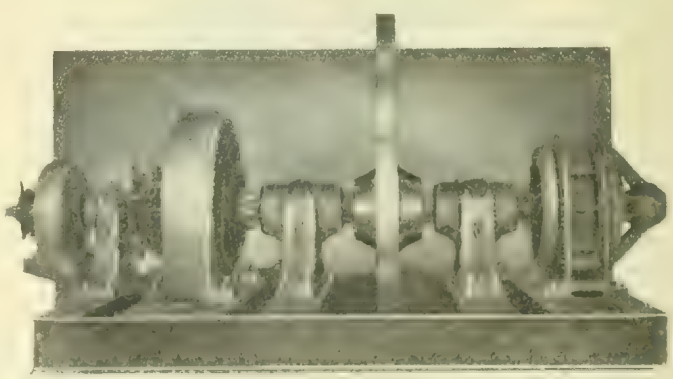


Fig. 10. Extra Heavy Fly-Wheel for Regulation

it is often necessary to resort to direct current, even when the prime source of power is alternating. In this case, an alternating current motor drives a direct current generator furnishing the necessary electric power, Fig. 9. In order to decrease the load fluctuations on the central power plant

and afford better regulation, fly wheels with extra heavy rims are sometimes used as shown in Fig. 10. Where the slope is long, and the speed fairly constant, fly wheels may not be of any decided advantage and special styles of direct current field control are resorted to in order to make the start and stop less apparent at the central station. Storage batteries and compressed air are also used as auxiliaries to even up the load curve. It is interesting to note at the time of writing this paper that one of the largest Nova Scotia coal mines is superseding its steam hoists by electric hoists, operated from one central power plant, where the economies referred to are used to best advantage. In this plant the generators will work at approximately 2,000 volts for some slopes, the power will be increased to 6,600 volts for overhead transmission to the slope and will be stepped down again to a pressure of about 2,000 volts, which will be carried in the mine for the operation of turbine pumps, and at the surface for the operation of hoists, etc. It is likely that the plant referred to will take advantage of superheated steam, extra low vacuum, and electrically driven auxiliaries.

Enough has been said to show that electricity is almost universally applicable to mining operations. If our mining engineers are careful in the choice and installation of these equipments, there is no question whatever but that there will be an increasing and satisfactory installation of much more electrical apparatus and in larger units. This is particularly true in connection with the saving of the now wasted bye-products. The number of accidents of an electrical nature in those mines which have used electricity most is remarkably small, which speaks well for the adaptability as well as for the care which has been taken in its installation by mine operators.

Business Getting for Central Stations

Many Problems to be Overcome—Keeping Records—Handling Complaints—Equalizing the Load—Advantage of Advertising—Much Depends on the Manager

By I. H. Wright, (North Bay)

A review of the history of commercial electricity would require volumes, but it would be squeezed into as many years. And to relate the experiences of the manager during that short period would require quite as many volumes. The poor fellow had to deal with all phases of the question. Indeed, he prepared himself for the worst when it was whispered around that six phases would be the standard for generators and general distribution. His best efforts were almost wholly given up to the operation of the plant, always confident that if he kept the system in good running order it would yield a good return to the investors "somehow." He expected business to gravitate in the direction of his office, as it were, and why not? Theirs was the only electric plant in the community and the people simply could not, so he argued, do without electrical service. Even electrical journals devoted their valuable space almost exclusively to engineering problems and to electrical generating and controlling apparatus. The same atmosphere prevailed whereever electrical conventions were held. But that day is past.

A marked change is evident in the methods and attitude of the central station manager. So far-reaching, indeed, has this marvellous and ever-increasing trade become that it is felt even in the very bowels of the earth, where the output of mineral wealth is dependent upon the cost and supply of electricity. Even the farmer is recognizing the value of the unseen power which moves the wheels of industry, now a household word throughout the civilized world.

Secret of Increasing Business

As the engineering problems have been met and overcome, thanks to the untiring efforts of our schools of science, the manager now finds it possible to direct his attention to the market for his product. It is of value, therefore, that we pause and look carefully into some of the main features which hold the secret to increased business.

The same general principles underlying successful selling of merchandise apply with equal force to the electrical trade, viz., good service and good business methods. The former can be obtained if the money is in the treasury, but if such funds are lacking it is probably due to want of confidence on the part of the shareholders in the possibilities of the plant. Such is often the lot of the manager, but it is his opportunity to convince them by sane arguments that the business can be obtained if the proper methods are followed. Very often, however, poor service is due to indifference on the part of the manager himself. It is deplorable to see evidences throughout the country of neglect on the part of the manager in this regard. There is nothing perhaps of greater importance in the home or place of business than light, heat and power. At one time electric service was looked upon as a luxury to be enjoyed by a few. To-day, it is a necessity everywhere. Since, as a rule, the public is dependent upon one central station in a community for its electrical necessities, the manager cannot be excused who shirks his obligations to the public dependent upon him for good service. Indeed, failure in this respect often spells failure in the company's annual statement.

The second essential in the success of building up a central station load involves many problems. It has to do with the frank, open methods and business tact of the manager who instils that same attitude towards the public, in the men under him who have to do especially with the consumer. It should be their aim to inspire confidence and promote good feeling. This can be accomplished in many ways but the chief among them points in the direction of the staff in the office and the system of keeping records. How often the accountant realizes his helplessness in his efforts to convince the customer that the account as rendered is absolutely correct and still more distressed is he when he knows in his own heart that there is room for doubt because of the system of keeping records in the office. This lack of confidence often finds its way into the minds of the shareholders, because of the incompleteness of the manager's annual statement. Construction accounts and operating expenses often conflict, leaving the auditor astride the fence in closing the books for the year.

Method of Handling Complaints

Next in importance to the system of keeping records, is the method of handling complaints. While it is true there are chronic kickers in every community, it is equally true that there are those who have just cause for complaint, and, a manager cannot afford to overlook or appear to neglect the customer's grievance. It should be sifted to the bottom, and whether he is satisfied with the decision of the manager or not, it will be found that little will be heard

from others concerning the man with the grievance. Perhaps the companies in general have not yet recognized the value of a systematic campaign against dissatisfaction amongst their consumers, but it is evident that Hamilton is awake. Like most other public service corporations, the Hamilton Electric Light and Power Company has had its share of complaints which, while not more than ordinary, nevertheless meant dissatisfied customers and the possibility of their becoming users of other commodities. To get at the bottom of these complaints a house to house campaign was decided upon, because by this means the company could get in touch with the tenants of every house, flat, etc., where electricity could be used, ascertain the grievances of its present customers, and in addition find out why tenants were using other commodities in preference to electricity.

Six men were considered a large enough staff for the work of canvassing Hamilton with its population of 75,000, and these were thoroughly informed on the company's policy. For the first few days the men stayed out only a few hours and the rest of the day was given over to sessions in which the complaints and questions (out of the ordinary) each man had received were discussed. In addition to special calling cards, the canvassers were furnished with report blanks, and a special number of the company's monthly publication, the Electrical Bulletin, which in addition to short articles on complaints and co-operation, had information regarding rates. The canvassers in all their calls dealt directly with the man or woman of the house, and not with servants, housekeepers, etc. This oftentimes necessitated an extra call or a trip to the office of the man of the house.

A few days after the campaign started, newspaper reporters were apprised of the fact, with the result that the issues of that day contained front-page articles on the efforts the company was making to satisfy all its customers, etc. The canvass worked well and the canvassers, although they made only one call, closed contracts daily.

The complaints of the customers were given special attention. A letter was immediately sent to the customer stating that a representative had reported his complaint and that it would receive immediate attention. The complaint was then turned over to the proper department and thoroughly investigated. Where the complaint was based on a high bill the meter was either tested or changed, as seemed advisable. A letter was then sent giving the results of the investigation and stating what had been done to improve the service, etc. Other complaints were looked after in the same thorough manner, as it was realized that if complaints are made and not properly investigated it works against the company.

By investigating the different complaints and improving the service in some places the company made many good friends and found that taken altogether the house to house canvass, with prompt attention to complaints, was the best advertising.

How to Get New Business

Successful methods of taking care of complaints help to hold the business we have, but other methods must be employed to get the business we never had, and this brings us face to face with the rate question. This subject has probably received more discussion through the press and on the platform than that of any other question touching upon getting business. At the last convention of the Canadian Electrical Association two very able papers were presented on making rates but the discussion which followed, while instructive, only tended to justify the deep seated conviction that each company must work out its own salvation, using the general data at their disposal to suit local conditions. One thing is apparent however, that a variety of rates must be decided upon if we would get all the business possible in any community. The chief factor to be considered in making rates is the peak load. It is clear that unless a company is developing a load under a decided disadvantage, energy can be profitably sold off peak at a very much lower figure that that sold during the hours of maximum demand. This off peak load is found in all parts of the community.

No field offers such splendid possibilities for development as the residential sections where not so very long ago the companies feared to tread. Here the electric iron takes the lead. Toasters come second in demand while the disc stove, water heaters and the variety of cooking utensils find a ready sale. There is also a growing demand for small motors to operate washing machines, sewing machines, etc., and it is not surprising to see how rapidly the vacuum cleaner is finding its way into many homes. Then again in the commercial district there is little difficulty in introducing the tailor iron for all kinds of pressing. Water heaters are a great convenience in barber shops, etc., and small motors are finding their way into butcher shops, ice cream and refreshment booths, etc. These and many other useful appliances can be introduced by carefully observing the wants of our customers. As this article is being written the writer is inspired by the melodious sounds from a piano operated by a motor across the way.

Day Load Depends on the Rate

But success in obtaining this much desired day load is largely dependent upon the rate. How are we going to make a rate sufficiently low to induce the residential section to use these useful and labor saving appliances? The Hydro towns have been largely under the influence of the Ontario Commission and while the rates generally adopted are likely to work out satisfactorily, it is more difficult for a company to institute the stand-by charge system because they are bound to recognize public opposition in "paying something for nothing," as they interpret it. Every manager has doubtless been more or less successful in the adoption of a bright idea of his own. It would seem however, that private companies must let the public get accustomed to the stand-by charge system through the influence of the Ontario municipal hydro-electric plants and in the meantime we might take a middle course.

Two Classes of Customers

This has been carried out satisfactorily in the writer's experience. The residential consumers were divided into two classes, viz: "the night consumer" and "the day and night consumer." The former class represents consumers of current not on record as having in use an electric iron, hence the current consumed by them was considered peak load business. The latter class, while using current on the peak also use off peak hence we considered them deserving of encouragement and decided to adopt a preferential rate. For both classes we adopted a basic rate of 15 cents per kilowatt and allowed a discount to the night consumer of 10 per cent. for cash in ten days, accounts payable monthly. To the "night and day" consumer we charged the same rate as to the night consumer but only on the first ten kilowatts. This we predetermined to be a good average monthly consumption of current in residences during the night of maximum demand. Hence a charge of 15 cents with 10 per cent. off giving us 13½ cents per kilowatt would also take the place in a sense, of the so-called stand-by charge. Upon all current over 10 kilowatt we allowed a discount of 40 per cent., making a net rate of 9 cents.

The decided preference in favor of the "night and day" consumer had the desired effect. It introduced electric irons in many homes without the aid of an agent and was more effective than any other indirect method adopted for

the introduction of electrical appliances. Of course local conditions might permit of a larger discount that that shown here and if that is possible there should be no hesitation in giving the consumer every encouragement to use more current off peak.

Cooking by electricity by means of an electric range demands a special service line and being off peak for the most part, is receiving more or less attention by central stations. The Hughes Electric range made in Chicago has proven to be a good competitor where gas is available and under favorable conditions current can be sold at 3 cents per kilowatt. Other makes of ranges no doubt are procurable which are as serviceable but the one mentioned is reliable and reasonable in price. Of course a special meter should be installed of large capacity and placed in such a position that the customer can see what it is costing for the different foods cooked.

Off-Peak Business in Commercial Districts

To develop off-peak business in the commercial districts would only seem feasible by the introduction of a scale of discounts according to the amount of current used in any one month, using a basic rate which could be the same as that adopted for the residential, viz: 15 cents per kilowatt hour. The following discounts have proven satisfactory:

From 1 to 30 kw. a discount of 1½ cents per kw. hour; 31 to 45 kw. a discount of 2 cents; from 46 to 60 kw. a discount of 2½ cents; from 61 to 75 kw. a discount of 3 cents; from 76 to 90 kw. a discount of 3½ cents; from 91 to 105 kw. a discount of 4 cents; from 106 to 120 kw. a discount of 4½ cents; from 121 to 150 kw. a discount of 4¾ cents; from 151 to 180 kw. a discount of 5 cents; from 181 to 200 a discount of 5¼ cents; 201-200 and over a discount of 5½ cents.

By adopting such a scale of discounts we obviate the necessity of a two rate meter. Usually, however, heavy tailor irons and apparatus demanding large heating current require a special meter and a special rate is necessary running from 9 cents down to 4 cents, depending upon the demand. A basic rate of 10 cents with discounts for this class is recommended.

Consult With Experienced Engineer

Power business while obtainable in every town, requires special consideration and oftentimes the best proposition can be worked out with the co-operation of a consulting engineer. Local conditions govern the rates to such an extent that the subject can only be touched upon. Methods of producting power other than by electricity and the nature of the business solicited have everything to do with the basis upon which the contract can be closed. We are all more or less familiar with the variety of rates now generally adopted. Notwithstanding this fact a glance at the central station meters discloses the drop in power demand between eight in the morning to four in the afternoon. It would appear that we have not yet perfected the art of getting all the power business in any community. Perhaps we are following the well trodden path too closely instead of exploring the many untried theories.

Advertising is Effective

Whatever the possibilities may be for increasing the station load, we must employ every conceivable method to discover where it is and one of the most effective means is found in advertising. To advertise well costs more than the power production very often, but it is as needful in the small central station business as in the large cities. Commercial houses have proven that the large bill posters pay the best, but lack of co-operation on the part of companies prevents individual stations from adopting the posters with large illustrations which beyond a doubt bring the most business. Their cost makes this method prohibitive. A less costly method has proven very effective in the use of cotton in two widths and about thirty feet in length upon which the advertising matter is painted. This style of sign can be made very attractive and lasts as long as is desirable, because illustrated signs should be changed about twice a year. By erecting the sign on the side of a large building or stretching on four or six stretches of wire secured to two posts, one at each end of the sign, it will last four months in all kinds of weather. It should be noted of course that the sign is illuminated at night by lamps hidden from the line of vision by means or reflectors.

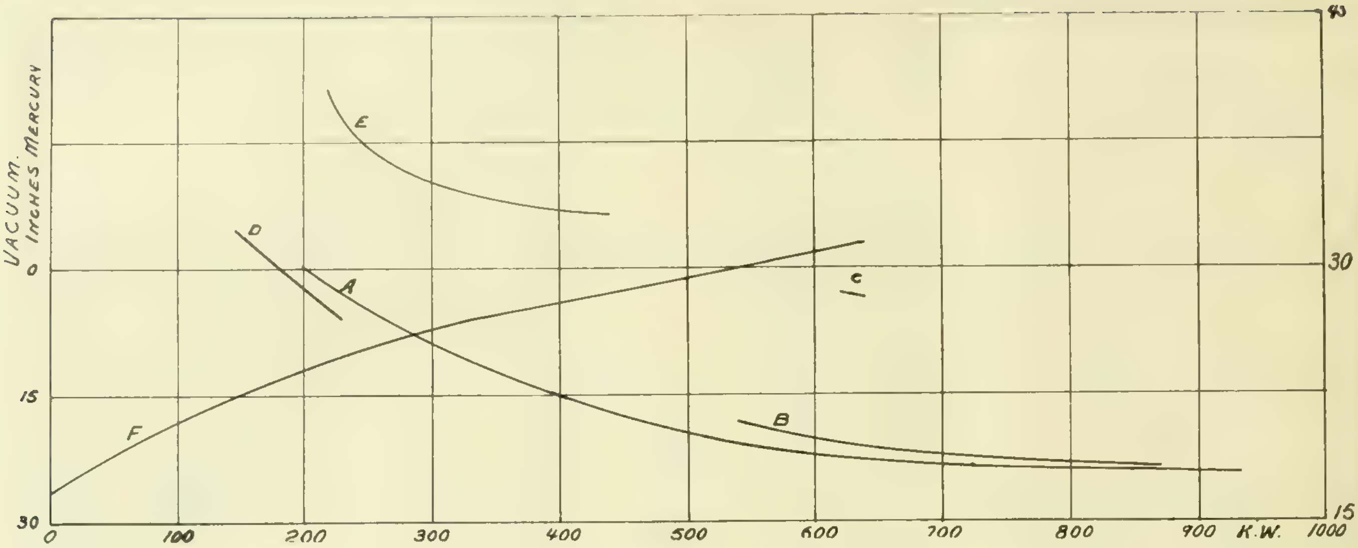
Very profitable advertising can be carried on from month to month with the splendid illustrated circulars supplied by the manufacturers of electric heating goods and apparatus. The Canadian General Electric Company for instance are awake to the splendid possibilities in this method. These illustrated pamphlets can be mailed with correspondence and with the monthly accounts as well as furnishing the canvassers for business with sufficient to introduce the particular articles being pushed. Advertising is certainly profitable, but there is no better method of increasing the central station load than that of personal contact with the customer. It is more effective becauce no argument is lost and an opportunity of answering every question and meeting every objection is afforded. We cannot afford to stop there however. We must press the question to a finish by offering to send the goods on trial and if we obtain his consent in this particular, the goods in nine cases out of ten can be considered sold. Numerous other methods have been adopted with equal success but these have been well tried and it remains for the central station manager to hammer away, knowing that he has the best and the people need it, in fact must have it. And as he thinks of his success here and there, he is encouraged with the thought that "every little bit added to what we have, makes a little bit more."

Operating Curves of Low Pressure Turbine

The accompanying curves in connection with the low pressure exhaust steam turbine installation in Regina will be of great interest. In our April issue we reproduced load curves of this engine and described the Regina installation. There are two steam units, a 22⅞ inch by 30 inch Corliss type connected to a 300-kw. generator and an 11-inch and 20 by 14 inches Ideal type connected to a 100 horse-power generator as well as a 9 in. by 9 in. Sturtevant which operates the condensing outfit.

The turbine is installed to take the exhaust either of the 300 kw. engine alone, the exhaust of the steam driven condenser, the exhaust of the 100 kw. unit and condenser the exhaust of both engines and condenser or the exhaust of any engine may be supplemented by live steam from the boiler or the turbine may be operated on live steam alone wired down to inlet pressure.

Curve A shows the total output from the low pressure turbine and from the 300 kw. engine and condenser all oper-



ating together. Curve B shows the total output with the 300 kw. engine, the 100 kw. engine and the condenser operating through the low pressure turbine. Curve C shows the low pressure turbine output operating on live steam reduced to inlet pressure. Curve D shows the total output 100 kw. engine and condenser exhausting through low pressure turbine. Curve E shows turbine output alone operating on exhaust. Curve F shows inlet pressure on turbine for turbine load; steam pressure 150 lbs. gauge, 100° F. superheat, vacuum average 28.5 inches referred to 30-inch barometer. For the above information and curves we are indebted to Regina's city electrician, Mr. E. W. Bull.

Town of Brockville Operating New Plant

The town of Brockville has recently placed in service a steam operated electric plant for its municipal purposes, for sale of power for industries, and for domestic uses. This town owns and operates all its public utilities, including water supply, coal gas, and electricity; these three services are controlled by one Commission, lately established, and the results, in quality of service and financial returns, have proven the wisdom of the whole project.

The electrical and gas interests were bought by the town from private owners in 1900, and until 1911 were operated by the Brockville Light and Power Department. This Commission merged with the waterworks department this year, when the new steam electrical plant was completed occupying a new building joined to the waterworks, and supplied with steam from their joint boiler plant.

The new station supplies 24-hour power, in place of the former night load only, and instead of the original two-phase system, three-phase current is supplied. The waterworks and power house are built on the north bank of the St. Lawrence river, a short distance east from the centre of the town. The former electric plant was placed about one mile west of the new plant.

In order to reduce the fire risk of additional buildings in the vicinity of the waterworks station, the power house has been constructed entirely of fireproof materials; there being no wood used in any place. The boiler equipment consists of four boilers, with provision for two more ultimately. Two steam mains are used, one direct to the pumping plant and one to the electrical plant, the former being [illegible]-inch, and the latter a [illegible]-inch main. Coal is transferred [illegible] at the waterworks wharf, and stored in a steel shed, alongside the boiler house; all coal is weighed on the barrows, between the storage shed and the boilers. Mechanical stokers and forced drafts are used on the boilers. The boiler breeching is made of ⅛-inch sheet steel, in circular and rectangular sections, reinforced with angle irons.

The chimney, built for the new electrical plant, was erected in the summer of 1910, by the Kellogg Company, of New York. A massive octagonal concrete base extends downward from the floor line to the rock, approximately 12 feet below, and the brick base of the chimney extends twenty feet above the floor line. A special hollow radial brick, with corrugated faces, is used above the base, to the full height of 125 feet. An inside shell of firebrick, thirty feet in height, extends above the flue opening, and makes an inside diameter of 5½ feet. Iron ladder rungs are embedded on the brick inside the chimney, reaching from the floor to the top.

The engines are of the enclosed vertical compound, double crank high speed type, with high overload capacity,

Exterior Brockville Power Building.

and operate with jet condensers, giving 26 inches vacuum, and with a steam pressure of 118 lbs. at the throttle. The engines were made by the Belliss & Morcom Company, of

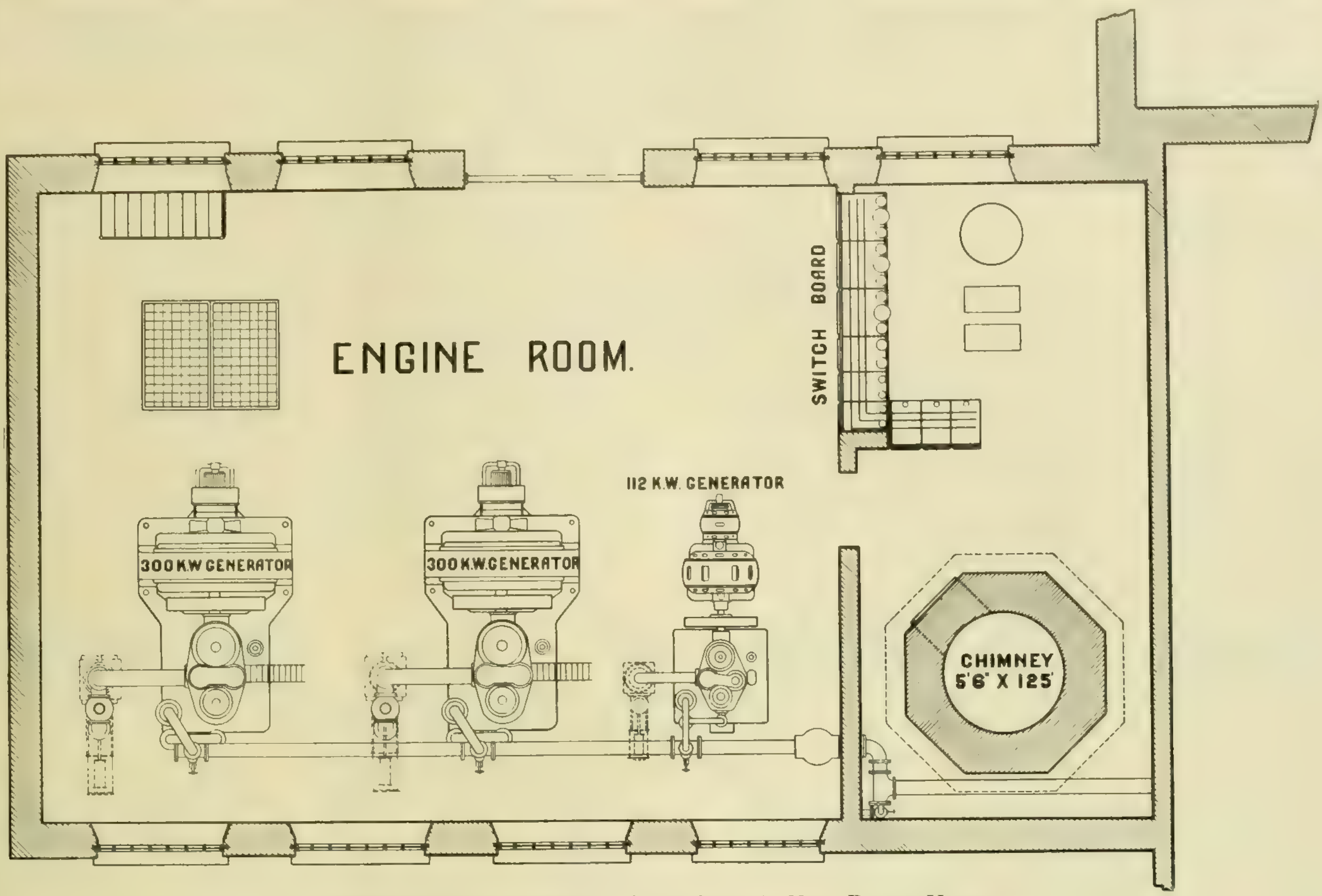


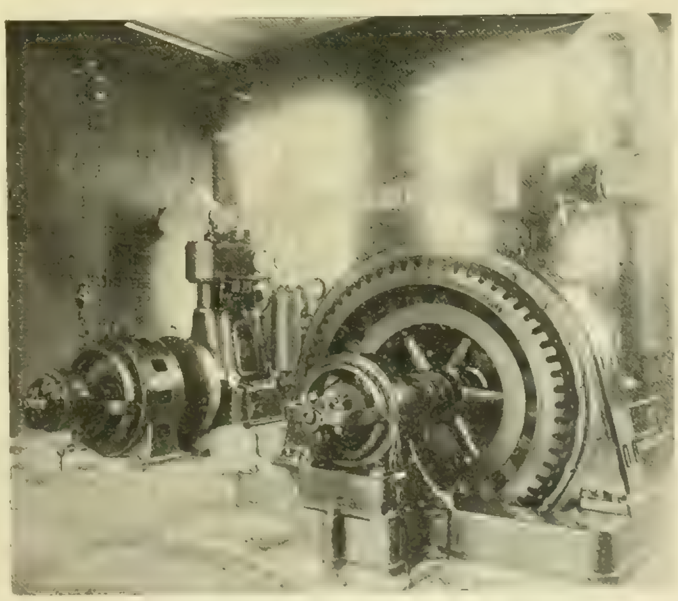
Diagram Showing Layout of Brockville's New Power House.

Birmingham, England, and were supplied by Messrs. Laurie & Lamb, Montreal. A particular feature of these engines is the forced lubrication system, each engine having oil pumps circulating a flood of oil in all moving parts. Another feature is the combined throttle and cut-off governing mechanism, which, along with the flywheel effect of the rotor with a separate flywheel on the shaft between engine and generators, gives an extremely sensitive speed regulation. The engines have a full complement of accessories, such as separators, water, waste and oil traps, independent steam valves, pressure and vacuum gauges, indicating tachometers, permanent indicator connections, etc.

The jet condensers are of the Knowles type, also supplied by Messrs. Laurie & Lamb. The condensers discharge directly into a common hot well, which overflows to a drain leading to the river. A separate 12-inch atmospheric exhaust system, with check valves on each engine exhaust, is auxiliary to the condenser lines. Water for condensers is drawn straight from the river.

The steam piping in the engine room is carried on 3-inch pipe standards. A 9-inch vertical separator is placed on the line, where the steam main enters the engine room, and is trapped to the hot well, along with the engine and auxiliary separators. All steam lines are heavily insulated with cellular asbestos wrappings.

The power equipment consists of three engine operated generators, one of 112 kilowatts output, and two of 300 kilowatts output. The 112 and 300 kilowatt generators are connected to engines of 150 and 450 horse power, respectively. Each generator is three-phase, with the full rated kilowatt capacity at 80 per cent. power factor, with output at 2,300 volts and 60 cycles. Generators are of the revolving field type, with speed of 360 r.p.m, for the 300 kw., and 450 r.p.m. for the 112 kw. machine. Armatures are wound in three slots per pole per phase, giving a well distributed winding. Bases are connected directly to the engine bed and generator bearings. The exciters are direct connect-



Interior Brockville Electric Power Plant.

ed to the generators, and are of the shunt wound type, each supplying the one generator only. The generators were supplied by the Swedish General Electric Company, through Messrs. Kilmer, Pullen & Burnham, of Toronto.

The switchboard is of nine panels of white Italian marble, arranged in two sections. The main board is set

flush with the power house dividing wall, so that all the mechanism is exposed in the switch room behind; the main board includes the three generator panels, the recording instrument panel (which includes integrating and graphic recording wattmeter), and the main three-phase feeder panels. The arc circuit switchboard is adjacent to the main board and has three panels, one for each of the three street lighting circuits; each of these panels includes a constant current lighting transformer.

The building is of red granite, with concrete floors for main floor and basement, and a reinforced concrete roof, supported on steel girders. Fenestra window frames and sash are fitted with wired glass, while the doors are of double thickness steel plate, in heavy iron frames. Pilasters support a crane rail and a 5-ton travelling crane, built by the Wm. Hamilton Company, of Peterboro; the crane is fitted with a 5-ton Yale & Towne triplex block.

The power house is lighted by means of eight twelve inch hemispherical holophane globes in brass flanges, set in a flat ceiling, each with three 80 c.p. tungsten lamps concealed above the ceiling with reflectors. All the lighting, including basement and switch rooms, is controlled from the lighting panel.

Feeders are carried out under the lawn in front of the power house in conduit, which rises on the poles at the street line. Due to the change in location of the power house from its former site, and also due to the change in phases, the line had to be very carefully marked on throughout the whole system, and the change over was effected without any interruption of service whatever.

Under full load water rheostat tests, all the equipment showed that all guarantees for electrical and mechanical performance had been more than fully met, and a rigid examination of all parts in service revealed no defects. All the equipment supplied was of commendable design and workmanship.

The construction of the power station building was undertaken by the manager of the department, Charles Wilkinson, and the materials and workmanship were entirely superintended by him. Mr. B. Dillon, architect, of Brockville, designed the building. Messrs. C. H. & P. H. Mitchell, of Toronto, were the consulting engineers for the Commission.

Forest Products of the Dominion

Extract from a Report by H. R. MacMillan, B.S.A., M.F., Assistant Inspector of Forest Reserves

The total number of poles reported as purchased in Canada during 1909 was 358,255. The total value at the point of purchase was $497,052. The purchases in 1909 were 92.9 per cent. greater than in 1908. The large increase of 172,448 poles was entirely due to an increase in the purchase of short cedar poles by the telephone and telegraph companies. It is for this reason the large increase in the proportion of short cedar poles used that the average price of all poles used fell from $1.53 in 1908 to $1.39 in 1909.

Cedar is the wood most frequently used for poles in Canada as it is practically the only Canadian wood growing to a convenient pole size which is cheap, easily handled and durable. There were 338,366 cedar poles purchased in Canada 1909, or 94.5 per cent. of the total. Larch furnishing 4.5 per cent. of the total stands next in the list. The remaining 2 per cent. is made up of spruce, Douglas fir and poles of unspecified species. The latter are, on the average, more expensive because a large proportion of them belonged to the higher length classes. Accompanying the great increase in cedar there was a decrease in the use of larch, spruce and Douglas fir for 1909. Telephone and telegraph companies are the greatest users of poles. They bought 83 per cent. of the poles used in 1909. The use of poles by these companies was 141.8 per cent. greater in 1909 than in 1908. The increase was all in cedar.

Steam roads used 11.9 per cent. of the poles purchased in 1909. The demand from the electric roads, power and lighting companies the least important users, was about the same in 1909 as in 1908. They account for about 5.1 per cent. of the pole consumption in Canada.

Where sufficient quantities of each species are purchased to afford a basis for valuation in the 20 to 25 foot class, spruce is cheapest, then cedar, larch and Douglas fir; the latter most expensive. This in itself would explain the great popularity of cedar, for it gives, for the money, more service than any of the other woods used.

The price paid for poles ranged from 79 cents each, for spruce poles, 20 to 25 feet long, to $6.71 each paid for poles of unspecified species 41 feet long and over. In every length class nearly all the poles are cedar. Spruce also appears in every class, but neither larch nor Douglas fir are used over 35 feet in length. Poles 25 feet long or less compose 77.5 per cent. of the total number of poles used in Canada. About 86.1 per cent. or 308,577 of the poles purchased in 1909 were 20 to 30 foot cedar. Excepting in the length classes, 36 feet and over, cedar poles are more expensive in Canada than in the United States.

Even with cedar poles cheaper in the United States many companies have found it economical to give poles, both those of cedar and other species a treatment with a chemical preservative so as to prevent decay and lengthen the life of service received from the pole. 10.6 per cent. of the poles used in the United States in 1908, 344,388 altogether, were given such a treatment. The steam railroad companies of the United States treated 30.9 per cent. of the poles they purchased in 1908, the electric companies 14.7 per cent. and the telephone and telegraph companies, 8.5. This preservative treatment though hardly in the experimental stage in Canada has become a settled procedure of economy in the United States, where it has been the subject of extensive investigation by the government for many years and where are now in operation 83 commercial plants for the treating of timber.

The treatment consists in the first seasoning of the wood, then thoroughly impregnating it with some preservative. The preservative that has been found to give the best satisfaction is creosote, a heavy oil which is a bye product of the manufacture of coal or petroleum tar.

A thorough creosote treatment costs about $1.40 a pole, assuming that labor is $1.75 per day, creosote 8 cents per gallon and fuel $5 per cord. At this rate it pays to treat cedar poles. The annual charge on untreated cedar poles, costing $9 net in the line and lasting 12 years, (as is the average given by Canadian users), at 6 per cent. interest, is $1.07. Treated cedar poles will cost $10.40, will last 20 years or more, and will thus cost only 91 cents for each year of service. This is an annual saving of $6.40 on each mile of line.

Protective Apparatus on high-tension Lines

A Discussion of Certain Methods of Isolating Faults on Power Supply Systems with the Switchgear Necessary

By H. W. Clothier

In the construction of high tension systems for general power purposes it is essential to provide for the disconnection of faulty parts and to make this operation automatic when faults are so serious as to be a source of danger to life, property, or to the continuity of supply. In consequence switchgear controlled by automatic devices has been evolved. It may be safely claimed that in recent years the design of such apparatus has reached a stage when it can be relied upon to operate with precision, but doubt often exists as to what system of protection to adopt. It is, therefore, of interest to consider what experience has shown to be essential on a large power supply undertaking, and this is the object of the following paper.

As in all apparatus, the primary considerations governing the design of successful automatic switchgear are:

- A thorough understanding of the functions which the apparatus has to perform;
- A rigid elimination of unnecessary parts, and
- A construction affording maximum security with minimum supervision and maintenance.

The true functions of automatic switchgear are the requirements imposed upon it by the general lay-out of the system as a whole. While it is not the purpose of this paper to consider the lay-out of high tension systems in detail, it is necessary to briefly review the principles in order to have a basis upon which the switchgear requirements can be considered.

Lay-out of High Tension Systems

The guiding principle in the designs of a large high tension power system (in so far as it effects automatic switchgear) may be summarized in the statement that the whole of the plant must be so arranged that failure of an individual part due to accidental injury shall not affect the supply to a single consumer. This condition calls for the instantaneous isolation of faulty parts, and such an arrangement of parts as to avoid breakdown on one affecting another. The only practical way to attain these objects is to subdivide the generating, transmitting, and transforming plant, so that in the event of failure of one sub-section the remainder will have sufficient overload capacity to continue the service; each sub-station being controlled by automatic switchgear inserted at the junction points between it and others. It is possible by carefully arranging the relative positions, etc., of generators, cables, transformers, etc., to ensure that one will not damage another by fire or impact when under breakdown conditions, but it is a comparatively difficult problem to guard against injury to one part of the plant from some abnormal condition of the load occasioned by a short-circuit or faulty operation of another part. Probably the scope of the switchgear in this respect is limited to the quick removal of the abnormal conditions by isolating the faulty part, although there may be other solutions, such as the automatic insertion of devices to limit the amount of current passing through a short-circuit.

The possibility of one part of the switchgear itself failing and injuring another is essentially a switchgear problem, but it should be taken into account when considering the lay-out of the whole system together with the fact that a bus-bar fault, or the failure of a switch to act when required, is equivalent in its effect to the breakdown of a number of sections. In order to provide against such contingencies causing a shut down to the entire system the network should be split up into a number of self-contained areas inter-connected in such a way that they can be automatically divided on the occurrence of a bad fault without seriously affecting the distribution of the load.

Essential Considerations in Switchgear Design

The requirements of switchgear considered from a protection point of view may be stated as follows:

- Reliable automatic operation under fault conditions.
- Inoperative, whatever the condition of the load, while the section which it protects is sound.
- Freedom from risks of shocks and burns.
- Freedom from breakdown under all working conditions.
- Reduction of cleaning, testing and supervision to a minimum.
- Robustness of construction to withstand all kinds of rough usage and to eliminate fire risks.
- Ready access to those parts where regular inspection is unavoidable, and
- Protection against shock by the automatic isolation of such parts before it is possible to handle them.

There are numerous types of switchgear in which several of these points have been given careful consideration, but, on the other hand, there are few which combine all the requirements. In particular the reduction of cleaning, the robustness of construction, and the protection against shocks and burns specially during cleaning, inspecting, adjusting, or repairing, are some of the items frequently overlooked in apparatus otherwise well designed.

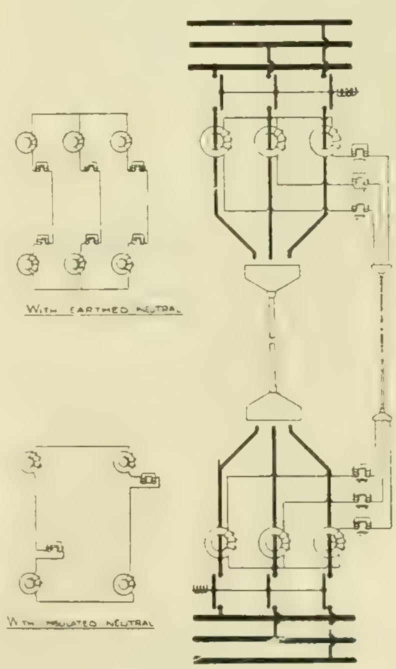


Fig. 1

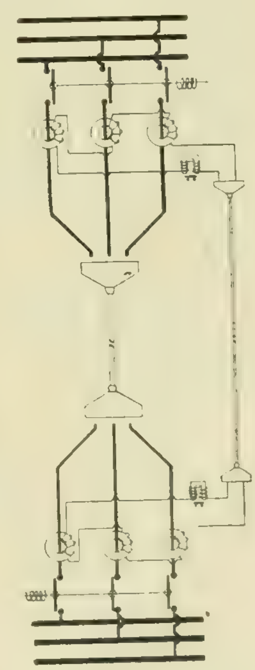


Fig. 2

Common Practice in Switchgear Construction

It is a common practice to install the various parts forming the switchboard inside cubicles constructed of cement or brickwork, thus providing fireproof divisions be-

tween the bus-bars and the remaining apparatus. In many cases the building containing the switchgear resembles a warehouse, the separation of parts being carried to the extent of allotting different floors and galleries to the respective parts; for example, the basement for cables and dividing boxes, the engine room floor for transformers, the first floor for switches and instruments, and the floors above for bus-bars. The connections between the parts consist of bare wires, or cambric or rubber insulated cables, which are threaded through porcelain insulators. Such apparatus has the advantage of having its parts readily accessible, but usually it calls for cleaning at frequent intervals, and not only is this expensive and inconvenient to arrange, but experience shows that, sooner or later, someone is apt to begin work on a live panel with serious results. It has also the disadvantage of occupying a large amount of room and involving expensive building construction, more especially so when to guard against engine-room accidents, such as the bursting of a steam pipe, it is necessary to wall off the switchgear from the engine-room.

Many efficient forms of oil break switches are in use, and these rarely, if ever, fail to open circuit at the sparking contacts provided the mechanism of the switch is in proper working order, and the contacts are well immersed in oil, but when opening circuit under very severe fault conditions, a considerable volume of vapour is formed and as this includes vapourised metal from the sparking contacts it lowers the insulation between all conductors in its immediate vicinity, and so tends to produce shorts between neighboring conductors. On one occasion a switch, while acting on a short, happened to be under close observation when flames and smoke were ejected through the joint between the tank and the top plate, and an arc simultaneously leaped across the exposed terminals above the switch, thus introducing a bus-bar fault of a serious nature. Unless the conductors are so partitioned from one another as to effectually separate all metal of differing potential, the enclosure of switches in cubicles only aggravates this trouble as it tends to confine the vapour to a limited space. The better precaution is to cover up all the bare conductors in the neighborhood of the switches.

In the best switchgear the insulation, separation and enclosure of the bus-bars has been very carefully studied, it being the practice to enclose each bus-bar in a separate concrete chamber. In this form the risk of a fault on the actual bus-bar would appear to be very remote, but it must not be overlooked that a fault on any conductor which is joined to the bus-bar and not separable automatically from it, is just as serious, and so to be consistent the good quality of insulation required for the bus-bar must also be extended to all the other parts thus concerned.

It has been a standard practice to provide means for disconnecting the conductors of each panel from the bus-bars and isolating switches or plugs are used for this purpose. In some designs elaborate interlocking arrangements are included to eliminate the risk of error in manipulating these isolating switches, but such arrangements are not always convenient or possible, and there are instances on record of power stations being completely shut down owing to mistakes rendered possible by the absence of efficient interlocking devices. The similarity in appearance of all panels opens up the possibility of a person accidentally entering a live panel, mistaking it for one which has been isolated. Locking off bars and "danger" boards are used to reduce these risks, but more positive methods than these are considered necessary to ensure safety.

There is some justification for the consternation felt in a power station when isolating switches blow-out automatically. This circumstance has been experienced owing to the abnormally heavy current occasioned by a short close to large generating plant, and for this reason it has been found necessary to lock all switches having a right-angle bend in the path of the current.

It is sometimes said that safety is best attained by making the presence of danger obvious, and acting on this principle many switchgear designs have been made with no pretence at the enclosure of live conductors. Whether the principle is sound or not from the point of view of safety to human life, it certainly does not afford immunity from faults occasioned by some foreign substance causing a short; many a rat has been pickled in a bottle as a memento of an intrusion which has been as disastrous to the continuity of supply as to the life of the rodent.

The Equipment of a Switchgear Panel

It is necessary to consider what is the irreducible minimum of equipment required in ordinary circumstances, and how far is it possible to avoid using parts which are inherently weak, however carefully made.

The principal features controlling the mechanical construction of the switchgear are—bus-bars, circuit breaker, and the discriminating devices operating it. There is so

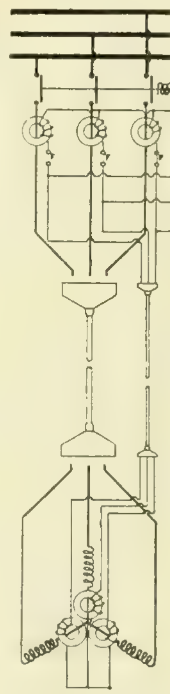


Fig. 3

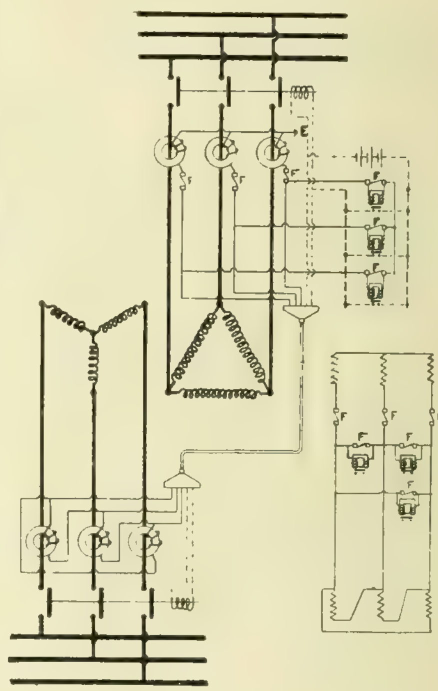


Fig. 4

little variety in the construction of the bus-bars that discussion on this point is limited to the material used, and the choice of a circuit-breaker is practically confined to an oil break switch. Under these conditions the considerations upon the design of the panel resolve themselves into a study of the types of discriminating device. Those which have been most generally used are overload devices (including a variety of designs, some operating instantaneously, and others with time element) and reverse current devices (also with and without time element devices), but so far the most satisfactory discriminating device which has been tried on a large scale and found reliable to operate with certainty when required and to remain inoperative when not required, is the "Merz-Price" system of balance protective gear.

The use of graded time limits in series has had an extensive trial as a discriminating system, but unfortunately this system has often failed on important high tension transmission networks. It has the disadvantages that it

cannot be used on a ring main, it is opposed to the principles of instantaneous release, and it is difficult, if not impossible, to predetermine the correct settings of relays at various positions on the system in order to isolate with certainty a faulty section without shutting down any of the healthy ones, i.e., it lacks discrimination.

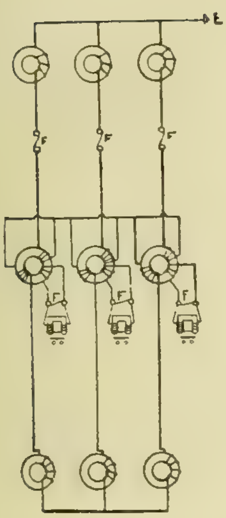


Fig. 5

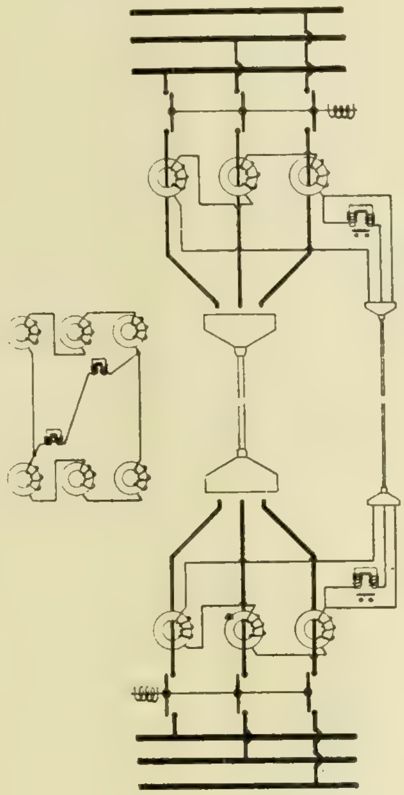


Fig. 6

Reverse current devices have been tried and have also been found wanting, the principal difficulty being to make them inoperative when faults occur on sections other than those which they are intended to protect. They are also useless, of course, as a means of protection in situations such as ring mains, when the flow of power may reverse under normal conditions.

Balance Protection

In the system of balance protection the criterion of operation is that, while a section is sound, the current entering it must be identical with that leaving it (excluding a very small amount due to capacity). Current transformers are installed at the entries and exits of each section, and a balance of their electrical properties is obtained. In the event of a fault or leakage occurring, the current leaving a section differs to that entering; the balance is thereby disturbed, and by means of relays the circuit breakers are automatically opened at the ends of the faulty section.

Three methods of connecting this system have been adopted—e.m.f. balance, current balance and neutral wire balance.

The connections of the former are as shown on diagrams (figures 1 and 2). The balance is obtained by having the e.m.f. at the secondary terminals of the current transformers in opposition, that is to say, under normal conditions no current flows through the pilot wire.

The connections for "current balancing" are as shown on figures 3, 4 and 5. The secondaries of the transformers are connected uni-directional, i.e., under normal conditions current flows through the pilot system in direct proportion to the main current. There were two systems developed under this category—the first, that shown on figure 5, has been called "magnetic balance," and the other that on figures 3 and 4, the "bridge" method.

In the third system, called "Neutral Wire Balancing," an example of which is shown on figure 6, the secondaries of the transformers are connected uni-directional as for current balance, the neutral wire connects between points of equal potential at the two ends of the section. In this case under normal conditions, no current passes through the pilot system on which the relays are connected.

Time Limit Overload Protection

In some cases it is desirable to supplement the balance gear with devices for protection against sustained overloads. With current balancing this can be obtained by merely inserting fuses in the secondary protective leads, as shown on diagrams 4 and 5. The introduction of a time limit device applied to feeder protection with e.m.f. balancing has also been suggested.

Balance Gear on Insulated Neutral Systems

The above diagrams indicate in each instance the connections for three-phase a.c. systems having the neutral point earthed which, considered from a protection point of view, is the most suitable system in that a fault of sufficient magnitude between either of the three phases and earth would operate the relays, and clear the faulty section before further damage is done there or elsewhere. On the other hand protection on an insulated system is simpler; for instance, compared with the connections on figure 1, the corresponding connections for an insulated neutral system would have the advantage that there is one less pilot lead and a saving of one current transformer and two relays at each end.

Leakage Protection

An interesting development of the balance protective gear is a system which has been called the "Core Balance," or "Leakage" Protection. This system provides for the instantaneous isolation of a circuit on the occurrence of a fault or leakage to earth, and, in common with the other balance protective gear, it is inoperative on ordinary overloads; moreover, it has the advantage that no pilot wire is required. Diagram of connections is shown in figure 7. It will be seen that a balance is maintained on the relay or trip coil circuit so long as the algebraical sum of the currents in the three cores of the main cable is zero. This

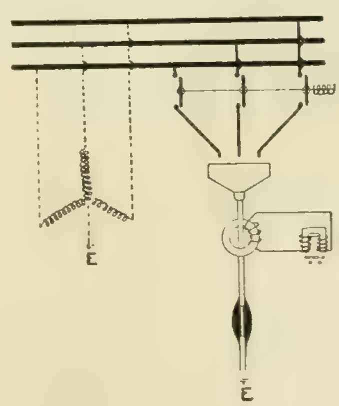


Fig. 7

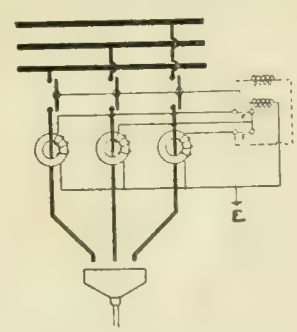


Fig. 8

balance, however, is disturbed immediately there is a leakage to earth on one or more of the cores, and the switch is thereby tripped, provided the leakage exceeds a predetermined amount.

Time limit protection against sustained overloads or faults between phases is often added by the introduction of fuses and another trip coil; a modification of this nature is shown on figure 8. The use of this system is of course strictly limited as a means of protection against faults on

high tension networks by the fact that it only discriminates between a fault to earth and an overload, that is, it is quite useless in its present form for ring main protection. It may, however, serve some purpose in the protection of tail ends and for mines and places where sustained arcing is a great source of danger, the system can be applied to advantage in that it offers the possibility of cutting out a

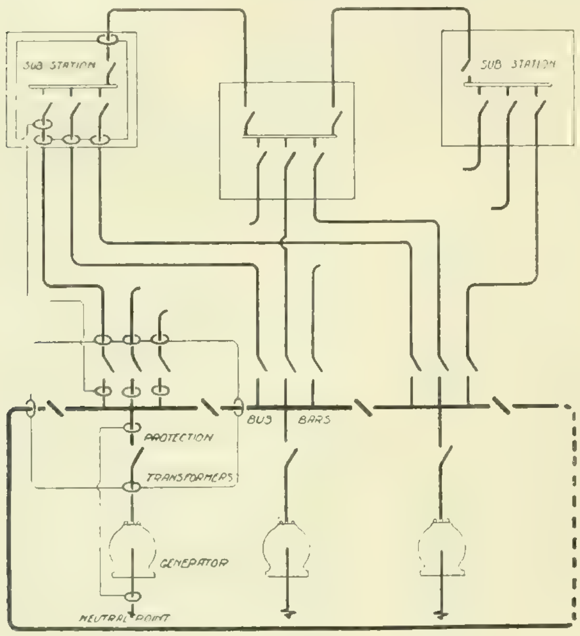


Fig. 9

fault occasioned by a fall of rock so quickly that no arcing external to the cable can occur. It has been suggested that as a system of leakage protection it is also possible to obtain some discrimination by grading a number of leakage settings on sections in series with one another, the one nearer the source of supply being set to trip out with the greater amount of fault current, thus following with some prospect of success the principle of one of the earliest forms of protection tried upon large power transmission systems.

Protective Gear Arrangements Generally

It will be understood that the balance system can be adopted for protection in a great variety of ways. The attached diagrams are intended to show some of these and to indicate the purpose for which they have been found most suitable. On a high tension power supply system the leading considerations concern the protection of generators, feeders and transformers.

Generator Protection

The principal faults to be considered are:

(1) A failing field;

(2) The failure of the prime mover, and

(3) A breakdown of insulation on the armature windings or main connections.

In some large power stations the engineers, preferring to rely upon the alertness of their operators, have no automatic protection on the generators. It is certainly questionable whether any automatic protection is necessary against faults (1) and (2). If, however, it be decided that some automatic protection is necessary, to guard against a failing field only, a relay with a time element can be installed which will open the main switch when a drop in excitation voltage occurs. But if protection is also required against motoring or a failure of the prime mover, a reverse power relay must be resorted to. The latter, however, must be provided with some time element feature to prevent it from disturbing the continuity of supply by isolating its machine at times when momentary reversals occur.

The breakdown of insulation in a generator circuit is a more serious matter as, under the conditions, not only is the supply jeopardised, but abnormal stress is put upon the conductors of the sound machines for several periods. Mr. Myles Walker has drawn attention to the fact that a machine running on a dead short at its terminals may momentarily generate 20 or 30 times its full load current, and from this some idea can be gathered as to the amount of current which would be fed into a generator fault when in a large power station with several machines in parallel.

The ideal generator protection would isolate the faulty machine within a fraction of a cycle without interference with the other machines. The nearest approach to this ideal is obtained by the balance system of protection. The arrangement which has been adopted is shown on figure 3 (current balancing). The fuses shown on this diagram may be used for overload protection. The usefulness, however, of the fuse in this instance is limited, as under ordinary circumstances it would need to be set very high and could not be considered a sure means of operating in the event of a bus-bar fault occurring; its chief use is that it permits of a light overload setting on special occasions, such as when a separate machine is running on a test.

Bus-Bar Protection

The bus-bars must be absolutely reliable in a power station, and they should be so substantial and the insulation so secure that there is no need to provide automatic protection. Figure 9, however, indicates the possibilities

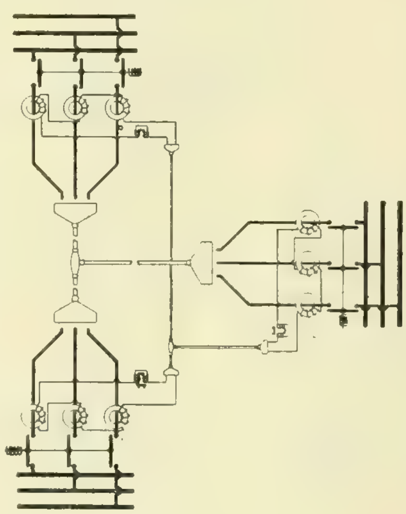


Fig. 10

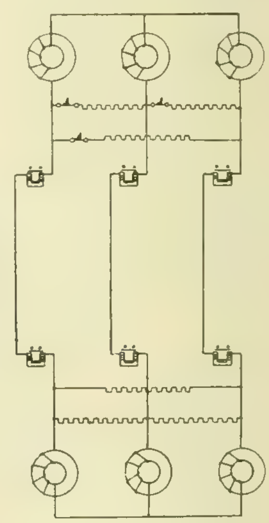


Fig. 11

of bus-bar protection, current transformers being placed on each entry to and exit from the switchboard, or any section of the same. These transformers are so connected that a balance in the secondary circuit is maintained under healthy conditions, but immediately a short or an earth occurs on any conductor on the switchboard all the switches connected to the faulty section would be opened, thus isolating the bus-bars and all the electrical connections attached to them. A sub-station switchgear was equipped on these lines and the experience obtained with this was sufficient to prove the principle.

In some power stations elaborate provisions have been made to guard against switchgear failures, including the use of group switches, duplicate bus-bars, and in some cases even duplicate feeder and generator panels. It is suggested that, although automatic bus-bar protection in a power station is undesirable on account of the expense and the

complications involved, it is nevertheless preferable to some of these other provisions which have been made, the more so on account of its discriminating action.

Trunk Main and High Tension Feeder Protection

The simplest arrangement of connections for balance protection on feeders is shown on figure 1.—e.m.f. balance. This figure illustrates the standard arrangement adopted by the power supply undertakings in Northumberland and Durham. A modified form of this arrangement is shown in figure 10.

The setting of the relays at variaus positions on the high tension network should be determined by the amount of current possible through a fault occurring at the respective positions; this amount varies with the resistance and inductance between the point where the fault occurs and the generating plant, and also within certain limits with the aggregate power in the generating plants. In order to obtain the best results in the equipment of protective gear each system should be considered in relation to its own conditions. In practice it is usual to have a diagram of each high tension cable network, showing the number and sizes of cables. In addition, a diagram should be kept up-to-date, showing the resistance of each connection, and the approximate amounts of fault current calculated therefrom which would be expected at the several parts of the system in the event of short circuits occurring. The diagram could show two values of fault currents, one for faults between phases, and the other for faults between one phase and earth.

Combined Balance and Overload Protection on High Tension Network

The adoption of the balance protection on a large system carries with it the necessity for sectionalizing the various ring mains and interconnected network by means of overload cut-outs at certain points; for instance, in the absence of some form of protection to automatically isolate a sub-station switchgear in the event of a short circuit occurring on its bus-bars, a heavy current would be fed into the fault. This would lead to a disaster, as the generator and feeder balance protective gear in circuit would remain inoperative. In order to guard against the possibility of a shut-down under such fault conditions, the network is divided into areas which are interconnected by cables equipped with an instantaneous overload release, and time element overload devices are installed at the generating station end or at other sources of supply to the several areas. With an arrangement of this kind a bus-bar fault occurring in any of the areas by bringing out the instantaneous overload devices separates the areas and leaves the faulty one to be dealt with by the time limit overload devices. As a rule, current transformers are existing for the indicating and integrating instruments, and, in many cases, it is possible to use these transformers for the time limit overload protection. The arrangement, however, shown on figure 11, might be used to combine time element overload protection with the balance protection, the secondary windings being shunted by resistances and time limit fuses for this purpose.

Transformer Protection

Diagrams 4 and 5 show connections as applied for the protection of static transformers. In this case it will be noted that current balancing is utilized. Either arrangement admits of the protective current transformers being also used for working instruments, provided, of course, that suitable provision is made to compensate for the impedence of the instrument circuits in order to preserve the balance by having an equivalent impedence on each side of the points of connection to the relays.

In the case of static transformer protection, it is desirable to include protection against a sustained overload, such as would be occasioned by a short circuit on the low tension bus-bars. This protection can be obtained by the insertion of three fuses in the pilot leads as previously described and as shown on both of the above diagrams.

In the early development stages of this form of protection it was found that abnormally large magnetizing currents were obtained at the moment of switching in. This excessive current was equivalent in effect on the relays to a fault condition. The difficulty was readily overcome by the insertion of a small fuse in parallel with the relay, as shown at F on the diagrams.

Reverse Current and Selective Relay System

Illustrated Description of a Relay System that has given Good Service on a Number of Canadian Power Lines

A circuit breaker may be defined as a switch which always returns to its open position unless locked in its closed position. This locking is usually effected by means of a toggle or latch. An automatic circuit breaker is one in which the latch or toggle is automatically tripped when predetermined conditions prevail upon the line which the circuit breaker protects.

The protection afforded by automatic circuit breakers which trip when the current in the line exceeds a predetermined value, is sufficient for most small plants and single feeders. Where large amounts of power are handled and continuity of service is imperative, two or more parallel transmission lines are usually installed and a system of relays is applied to each of these lines so as to automatically cut out the defective line the moment a defect appears. For this service, relays have been used on the principle of the wattmeter for the receiving end of the two parallel transmission lines. These were so connected that their contacts would close, tripping their respective circuit breakers when power was being fed back into the line which they protected. In practice, it was found that when a short circuit occurred near the relay, the voltage at that point of the system dropped so low that the relay was inoperative.

To obviate this trouble, a combination of "Reverse current relays" and "Selective watt relays" has been devised. This arrangement is shown in Fig 1. Following out the diagram, it will be noted that the tripping current to the circuit breaker passes through a relay switch, which in turn is operated by the closing of the contacts in the relays above mentioned. The contacts in at least one selective watt relay and its accompanying reverse current relay must be closed before the relay switch is brought into operation and the circuit breaker opened.

A selective watt relay is provided with shunt and series coils similar to a wattmeter and is arranged with contacts which are always closed except when power is passing in the normal direction, i.e., from the sending to the receiving station. The windings and the spring are so propor-

tioned that approximately 1 per cent of the rated load passing in the normal direction will open the contacts and keep them opened. This prevents the circuit breaker from being tripped out unless there is a reversal of power at the receiving end of the line. Overloads are taken care of by the

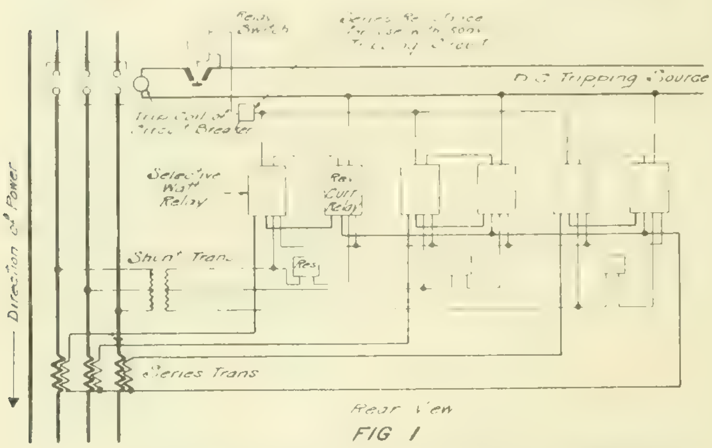


FIG 1

Connection Diagram for Combination of three Single Phase Reverse Current Relays and three Selective Watt Relays on a Three Phase Four-Wire Circuit

overload feature of the circuit breakers at the sending end of the line, shown at "C" and "D" Fig. 4.

If the short circuit occurs as at "S" Fig. 4, the selective watt relay "A" immediately closes its contacts while the selective watt relays at "B" keep their contacts open. When the current has reached a pre-determined value, the reverse current relays on both "A" and "B" close their contacts, tripping out circuit breaker at "A." The overload features at "C" trip out the sending end and so the defective line is automatically disconnected from the system, permitting service to continue over the good line. The reverse current relay which was developed before this combination was devised also has a selective action between current in the

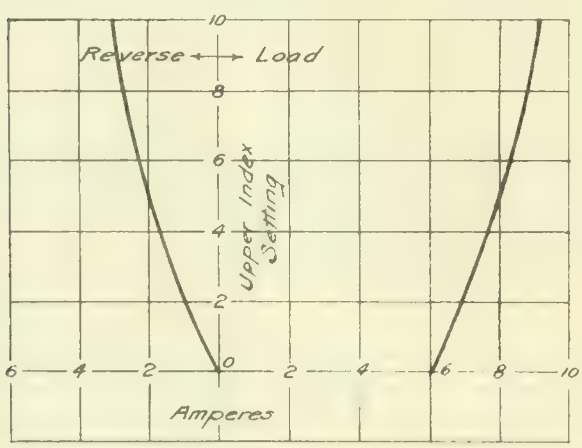


FIG. 2

Curve showing operation of relay with current and voltage applied

power direction and current in the reverse direction. This feature is supplied by means of a shunt winding which gives it somewhat the nature of a wattmeter. When the voltage is normal, the operation of the reverse current relay is shown by Fig. 2, i.e., suppose the upper index to be set at 2: 1 ampere in the reverse direction will close the relay contacts, while [illegible] amperes are required in the power direction to close the contacts.

If a short circuit occurs close to the relays with consequently very little voltage at the relays, the reverse current relay acts as an ammeter and its performance is shown by Fig. 3.

This system will trip out the defective line even when the short circuit occurs just outside the circuit breakers at the receiving station, whereas the earlier system of using only a wattmeter type relay would probably result in tripping out both the lines at the sending end, due to overload, since the voltage at the receiving station would be so low as to make the wattmeter type relays inoperative.

The selective watt relay system can also be used where synchronous apparatus is operated. In this case, the reverse

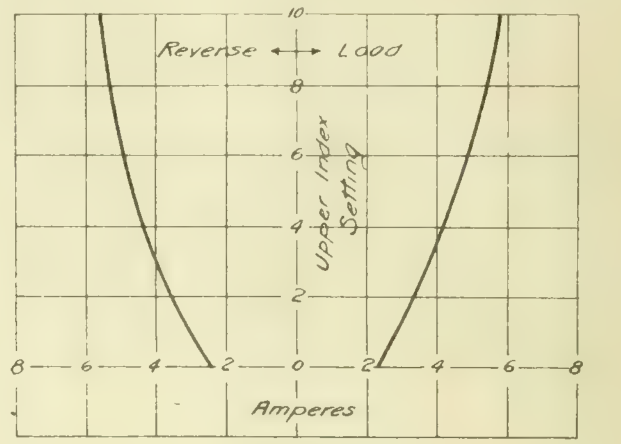


FIG. 3

Curve showing operation of relay with current only.

current relay setting is made such, that the ordinary reversal of power which so often occurs in synchronizing is not sufficient to trip the breakers, but should a short circuit occur, this reversal will be far greater and the defective line will be tripped out. It must be remembered that the selective watt relay makes this system inoperative for overloads since its contacts are open so long as power is flowing in the positive direction. When this overload protection is desired, it is supplied by giving the circuit breakers at the sending end the straight overload tripping feature. It can also be supplied at the receiving end if desired.

This system of relays supplied by the Westinghouse Company, has been operating so satisfactorily for some time on some of the Shawinigan Water & Power Company's lines

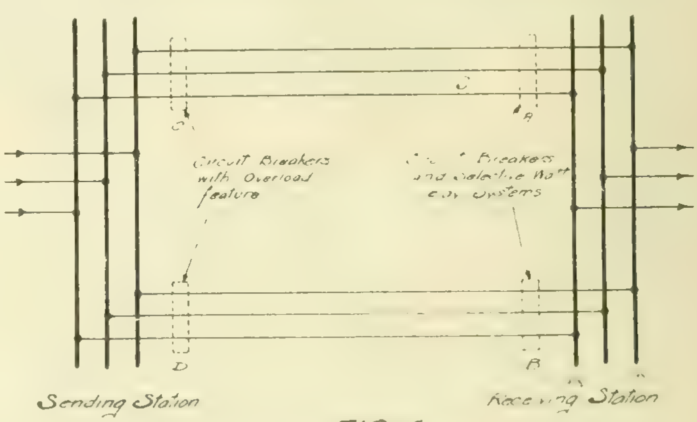


FIG 4

Parallel transmission lines equipped with reverse current Relays and Selective Watt Relays

that they have decided to install it on their new system. The Westinghouse Company are supplying a similar installation for the Kaministiquia Power Company, as well as for the Continental Light, Heat & Power Company, the Mines Power Company, the City of Winnipeg, the Calgary Power Company, and several other systems.

Street Railway Department

Car arriving at St. Lambert End of Victoria Jubilee Bridge

Mr. W. B. Powell

Montreal's Suburban Service—Electric Trains Operated—Excellent Terminal Facilites—Immediate Extensions Planned

The Montreal & Southern Counties Railway Company started operating a passenger service between Montreal and St. Lambert, a distance of 3½ miles, on Nov. 1, 1909. The extension from St. Lambert to Longueuil, about four miles more, was completed and opened on May 28, 1910. This summer an extension of a mile and a quarter to the golf links and the county club house will be made and later this branch will be extended through the counties of Laprairie, Chateauguay and Huntingdon. At the same time the main line will be constructed as far as Chambly, which is thirteen miles from St. Lambert.

The company has sufficient rolling stock to give a very satisfactory and frequent service, over its line with the result that St. Lambert and Longueuil are rapidly becoming popular residential centres. They are situated on the south shore of the St. Lawrence river, opposite Montreal. Many people who are in business in Montreal and reside there during the winter, live in St. Lambert in the summer. The trip over the St. Lawrence via the Victoria Jubilee bridge is a delightful quarter-hour's run. The cars are of the most up-to-date equipment, are hygienically upholstered with leather, the seats fact the front and the capacity is about the same as the standard railway coach.

The terminal facilities also are excellent. The regular schedule between Montreal and St. Lambert is a forty-minute service each way, but this is reduced to twenty minutes whenever the service demands it.

The system used is 550 volts D.C. from steam plant

Map Showing Partial Area Covered by the M. & S. C. Railway.

M. & S. C. Railway Rotary Snow Plough.

located at Pt. St. Charles. 10 cars are in daily use. Cars are 50 ft. long and double truck. Equipment is four 40 h.p. motors with K28 controllers.

The officials of the company are:—President, Mr. S. T. Willett; vice-president Mr. Thomas Craig, 2nd vice-president and general manager, Mr. W. B. Powell; sec.-treas., Mr. H. W. Cooper; electrical engineer, Mr. J. A. Burnett.

The management of the company is closely associated with the Grand Trunk Railway, of which it may be said to form a subsidiary.

Mr. James A. Burnett, under whose personal direction the electrical plant for the Montreal and Southern Counties Railway was installed was born in Montreal and educated at the Montreal High School. He was for some time with the Montreal Light, Heat & Power Company as chief

Mr. James A. Burnett

draughtsman, following which, having made a study of the subject of electricity and seeing the possibilities awaiting a career in this profession, he in due time devoted himself entirely to electrical engineering. He has contributed a number of articles on electrical subjects to technical journals both in Canada and the United States, and is an associate member of the Canadian Society of Civil Engineers and of the American Institute of Electrical Engineers.. In addition to his duties with the Montreal & Southern Counties Railway he acts as electrical engineer to the chief

Operating a train service, M. & S.C. Railway

engineer of the Grand Trunk Railway, and in this capacity has been entrusted with the direction and supervision of some of their most important electrical installations.

McKeen All-Steel Gasoline Motor Car

We give herewith photograph, description and specifications of the 70-ft. all-steel gasoline motor car recently built by the McKeen Motor Car Company, Omaha, for the Sand Springs Interurban Railway Company, of Tulsa, Okla.

General dimensions of car body:—Gauge, 4 ft. 8½ ins.; length over sills, 70 ft.; length over all, 72 ft. 9¾ ins.; width over side sills, 9 ft. 8 ins.; width over all, 10 ft. 2¾ ins.; height, inside floor to ceiling, 7 ft. 5⅝ ins., height, rail to roof, 11 ft. 9 3/16 ins.; lenght of passenger compartment, 28 ft. ⅞ ins.; length of smoking compartment, 16 ft. 4½ ins.; length of baggage compartment, 8 ft. 6 ins.; total seating capacity, 83; total weight, 68,000 lbs.

Engine:—Is McKeen 200 horse-power, six 10 in. x 12 in. cylinders, air-starting and reversible. Engine frame is of one solid casting of cast steel. Cylinders are cast in sets of three, of high grade cast iron, and water jackets are ⅛ in. copper. Crank shaft is of high grade carbon steel, each crank being fitted with counterbalance. The crank shaft, sprocket, securing the two halves of the crank shaft together, is of forged steel. The drive from the crank shaft is by means of 5 in. Morse silent chain. All bearing brasses are of especially hard phosphor bronze. Valves are of special high grade nickel steel.

Transmission:—All gears used in the transmission are of vanadium cast steel, and other castings are cast steel. Clutches are operated by means of two air cylinders controlled by an actuating valve in the engine room convenient to the motorman. The car is equipped with extra low gear, giving a speed of 8 miles an hour on low speed and 22 miles an hour on direct speed; also with New York Gregory brake valve, emergency hand brake, Wyoming sanders, acetylene headlight, M. C. B. Climax couplers, whistle, warning gong, communicating signals, American Railway Association lamp and flag brackets, and full tool equipment.

Detail of Motor Truck Construction:—Standard 4-wheel built up steel design; wheel base, 9 ft. 5 in.; front axle journals, 6 ft. 10 in.; rear axles, M.C.B. journals, 4¼ in. x 8 in.; weight on drivers, 24,900 lbs.; bolsters are fitted with automatic frictionless roller side bearings, and journal bearings and wedges are standard M.C.B. All castings are malleable iron. Driving wheels are 42 in. steel tired spoked wheels, and rear wheels are 33 in. rolled steel of special design.

Rear truck:—Four wheel built up steel design. Wheel base, 7 ft.; axles, special M.C.B. journals, 4¼ in. x 8 in.; truck is built on solid cast steel frame centre; bolsters are of cast steel, fitted with automatic frictionless roller side bear-

70-Foot All-Steel McKeen Gasoline Electric Car Operating on a U. S. Interurban Railway.

ings. Journal bearings and wedges are standard M.C.B., and wheels are 33-inch rolled steel of special design.

Framing:—Underframing is constructed of structural steel shapes, with one piece cast steel body bolsters; centre sill is 8 in. 22¾ lbs. "I" beam; side sills are 6 in. 8-lb. channels. The upper framing is largely of 2 in. grooved steel and 3 in. and 4 in. channels. Sections are securely braced to resist the maximum strain. Windows are round, with an opening of 24¾ inches. Sheathing is No. 12 American Bessemer, securely riveted to framing, forming trusses to support the car. Roof is of No. 16 sheet steel, closely riveted and all seams soldered solid, making an absolutely tight roof. Draft rigging is applied at each end, consisting of M.C.B. Standard Climax couplers. Pilot is of structural steel frame, the slats being of ¾ in. pipe, securely bolted and braced to front of car under frame.

Air System:—Air is applied by a pump driven by the engine, also an emergency gasoline driven air compressor installed in the engine room. The supply is carried in two 18 in x 96 in. and one 18 in. x 111 in. seamless steel tanks, secured in the car underframe, with suitable pipe connections, for whistle, starting engine and operating clutch gears and brakes.

Gasoline:—The gasoline is carried in an 18 in. x 111 in. seamless steel tank, with a total capacity of 120 gallons, which is connected to air system through special valve and reducer, which delivers gasoline to a small auxiliary gasoline tank in the engine room, then by gravity to the engine.

Water System:—The water cooling circulation consists of rotary circulation pump, cooling coils and expansion tank.

Lighting:—The car is lighted by an acetylene system, with 13 oval lamps in the passenger compartment, 1 bracket lamp in the baggage room, 1 bracket lamp in each toilet, 1 bracket lamp in engine room, and 1 lamp in centre vestibule.

Heating and Ventilating:—The car is heated by hot water, the heating system being connected into the water circulation from the engine. Ventilation is by means of intake air ducts, which deliver air at various points adjacent to the floor of the car, and foul air is exhausted at the roof by means of suction or exhaust ventilators.

Interior Finish:—The interior finish is in mahogany, with two toilet rooms fitted with Duner hoppers. The floor is of 13/16 in. hard maple with dumb flooring of No. 12 sheet steel. The ceiling in the passenger compartment is of pressed board formed to fit the roof of the car. Seats are Hale and Kilburn, spring cushions, and upholstered in plush for the passenger compartment and rattan for the smoking compartment. The car is thoroughly insulated by the use of lith placed between maple floor and dumb flooring, also between sheets and interior finish, and by use of linofelt placed between roof sheets and ceiling. Aisles in the car are covered to be absolutely fireproof.

Painting:—The car is painted with McKeen Motor Car Company's standard red color, lettered and striped in gold.

The same company has recently shipped a second 70-ft. car, of the same description as the foregoing, to the Sand Springs Interurban Railway Company, and have under course of construction two 70-ft. cars of the same design for the Peoples Electric Railway, of Muskogee, Okla.

Surburban Gas-Electric Railway Service

The General Electric Company recently delivered a gas-electric car to the Buffalo, Rochester and Pittsburg Railway. This type of car is admirably adapted for use on branch lines which at present may be operated at a loss by steam and where the amount of traffic does not warrant electrification, and its use on such lines may be expected to reduce operating expenses and increase traffic.

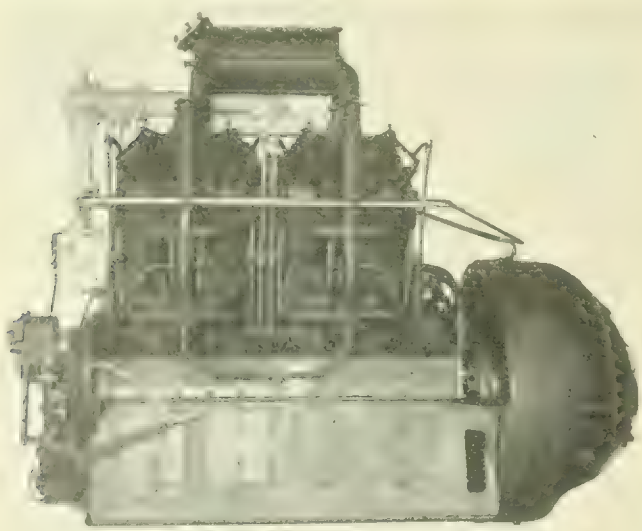
This car is 66 ft. long, 14 ft. 1 in. high and has a seating capacity of 49 in the passenger compartment and 20 in the smoking compartment, with two passengers per seat. The seats are sufficiently wide to accommodate 3 persons, so if desired, the passenger compartment will accommodate 69 and the smoking compartment 28, a total of 97. The car derives its power from a gasoline engine and transmits it to the wheels by means of an electric drive, thus avoiding any direct mechanical gearing or connection be-

Interior General Electric Gas-Electric Car.

66-Foot Gas-Electric General Electric Car Operating on B. R. & P. Road.

tween the engine and the wheels. The engine is direct coupled to an electric generator, forming a compact power plant located in the engine compartment. The electric power thus generated is applied to standard railway motors, mounted upon the axles. The car is operated by means of a suitable controller in a manner similar to ordinary electric trolley cars.

A 100 gal. storage tank supplies sufficient gasoline to carry the car 200 miles. The car is provided with automatic and straight air brake equipments and auxiliary hand brake

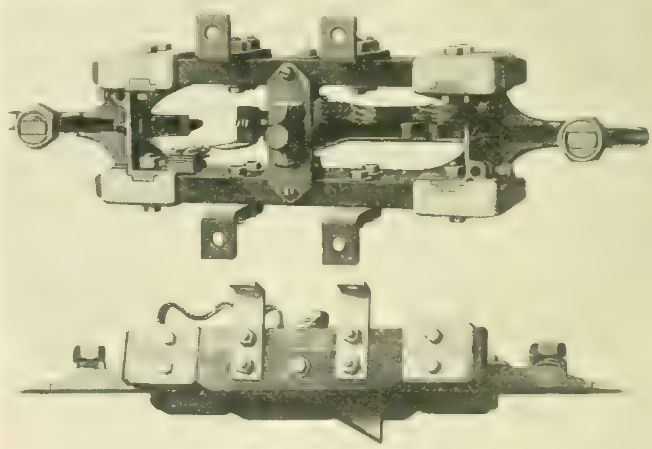


Gasoline Generator Set, Direct-Connected.

for use in case of emergencies. It is also equipped with standard automatic air signals.

The Westinghouse Automatic Section Insulator

Automatic Section Insulators are inserted at points where it is desirable to energize a section of trolley wire when the trolley passes onto it and to de-energize it when the trolley passes off. They are widely used in mining installations and are so constructed that a mining locomotive in entering a section will throw the switch of the insulator and energize the section. In returning, the trolley of the locomotive throws the switch in the opposite direction and renders dead the section just left. In construction the Westinghouse Automatic section insulator is similar to the Westinghouse Type K.B. section insulator except that a circuit opening-and-closing arrangement is incorporated in the automatic type. Side bars of impregnated hickory take the tensile stress due to the trolley wires. All metal parts are either of sherardized malleable iron or of a bronze composition. A wedge of the type that has given excellent service on standard trolley frogs is used to secure the trolley wire in each approach. Supplementing the wedge, an internally threaded chuck is provided. This, when tapped into its tapered hole, firmly grips the wire. Opening and closing of the circuit is effected by a switch blade, mounted on a rocker. Electricity is fed to the rocker switch-blade through a heavy, flexible, woven-copper bond, which is securely connected at each of its ends. When the trolley wheel is inbound, no arc can be drawn across the knife switch and contact because their connection is completed before the trolley wheel leaves the rocker, which is always energized. In returning, the trolley does not open the



branch line until the wheel has passed onto the rocker. As the automatic section insulator is used most frequently in mines, it is arranged for suspension from roof timbers.

A Canadian Holoplane Company

The Holoplane Company, Limited, the new company formed to take care of the growing business of the Holoplane Company in Canada, with headquarters at 60-62 Front street west, Toronto, plans to co-operate with central stations, architects, builders, fixture dealers, contractors and supply dealers in promoting a higher standard of illumination by educative campaigns throughout the country. The men at the head of the Canadian branch are well known and have had long and practical experience.

Mr. Chas. A. Howe, manager of the Toronto branch, was manager of the Chicago office for years. Mr. H. D. Howe, secretary of the company, has for years been identified with The Holoplane Company, being for some time assistant manager of the Chicago office and general purchasing agent.

Morgan P. Ellis, the sales manager, is already well-known to our western readers, having for some time travelled for the head company in the Northwest Territories.

Telephone Department

Multiplex Telephony and Telegraphy by Means of Electric Waves Guided by Wires

A paper to be presented before the 28th Annual Convention of the American Institute of Electrical Engineers, by George O. Squier, describes the results of experiments that have been carried on for a number of years over a seven mile line connecting the Signal Corps Laboratory and the Bureau of Standards, Washington. By using a very high frequency current, 100,000 cycles, and properly tuned telephones, a conversation can be carried on over the same wire and at the same time as another conversation, using the ordinary telephones, without either interfering in any way with the other. The inference is that, using various frequencies, a number of conversations could be carried on at the same time without interference. The difficulty of producing high frequency currents has alone prevented these further experiments to date.

The experiments were based upon the fact that since the limits of audibility may be taken to vary between 16, as a lower limit, and 20,000 as the higher limit, cycles per second, any vibration having a frequency outside of this range could not set up a vibration which would affect our ear. For reasons that are outlined at length in the paper a frequency of 100,000 cycles was chosen. This was produced by a specially designed electric generator also described and illustrated. The following summary of Mr. Squier's experiments and results will be of interest.

Speech Transmitted by High Frequency Currents

The first preliminary experiments were directed to a determination as to whether it is possible to superimpose electric waves of ultra-sound frequencies upon the minute currents now employed in telephony over wires, without causing troublesome interference with the battery telephone currents. Experiments were first conducted with various forms and types of telephone receivers in connection with local circuits at the generator. With a collection of receivers ranging from about 50 to over 8000 ohms resistance, and

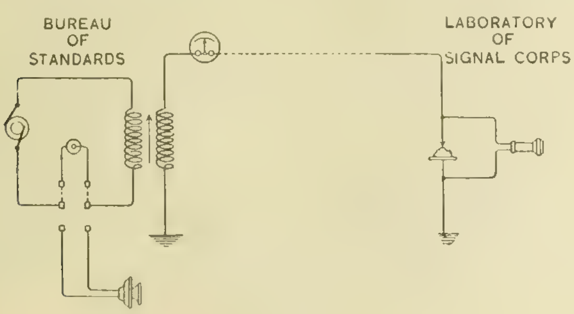


Fig. 1

of various designs, a series of tests was made under severe conditions. It was found in general that alternating currents of frequencies ranging from 30,000 to 100,000 cycles per second, when coupled directly, inductively or electrostatically to local circuits from the generator, produced absolutely no perceptible sound-effects in the receivers.

The next fundamental point considered was whether at these frequencies a telephone can receive enough energy to make it operative for producing sound-waves in air. In the wireless telegraph art where the frequencies involved are from 100,000 to several million per second, this problem has been uniformly solved by the introduction of some form of detector for electro-magnetic waves, whose function is to transform the energy of the high frequency oscillation into other forms suitable to a type of instrument such as a telephone receiver. Various forms of detectors such as are now used in wireless telegraphy were therefore tried between the telephone receiver itself and the energizing circuit. Since the frequencies being here considered were entirely above audition it was necessary in order to produce an effect on the ear, to introduce some method of modifying the continuous train of sustained oscillations from the generator into groups or trains, the period of which falls within the limits of audition. This was accomplished by employing the regular forms of automatic interrupters, such as are now used in wireless telegraphy, with the result that with these two additional and essential pieces of apparatus, the energy of the generator was delivered to the ear in a form well suited for physiological effects. In these latter

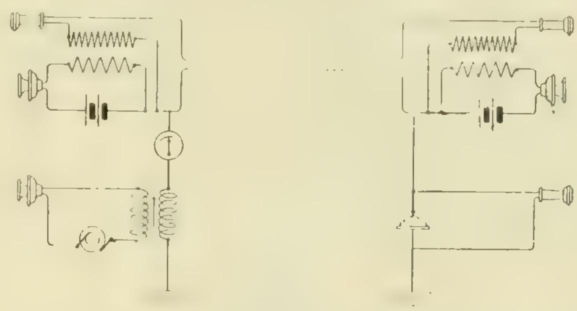


Fig. 2

experiments interrupters giving a frequency of between 500 and a thousand alternations a second were employed.

The elements of the apparatus thus far included a generator of sustained high frequency oscillations, an interrupter to modify the amplitude of these oscillations into groups of a period within the range of hearing, some form of detector to rectify these oscillations, and a telephone receiver. When in the above mentioned chain of apparatus the interrupter is replaced by some form of telephone transmitter, such as the microphone, all the essentials for the transmission of speech in both directions are present.

Experiments were made over local circuits with apparatus arranged in this order over a range of frequencies from 20,000 to 100,000 cycles per second, with the result that speech was transmitted very satisfactorily. Upon removing the detector from the above arrangement no perceptible effect upon the telephone receiver of such a high frequency circuit which did not include some form of detector was obtainable.

Duplex Telephony with One Grounded Circuit

To demonstate the fact that electric waves of ultra-sound frequency produce no perceptible effect when superimposed on the same circuit over which ordinary telephone conversation is being transmitted, the next step was to use such a train of sustained oscillations as described above for transmitted speech over a circuit already in use for ordinary telephonic speech. For this purpose the twisted-pair telephone line was equipped with a complete standard local battery telephone set as installed for commercial practice, and in addition one of the wires was equipped as in Fig. 1, the circuit being shown diagramatically in Fig. 2. This particular arrangement was employed in this experiment because it was desired to have the battery telephone operate on its usual circuit with the introduction of ground connections at the ends of the lines for the super-position of the higher frequency circuit. When such ground connections

were introduced directly without tuning elements inserted, the metallic circuit experienced the usual disturbances found under city conditions, but silence was immediately restored by introducing in the ground connections tuning elements of magnitudes suited to wireless telegraphy.

The twisted-pair telephone line was equipped with a complete standard local battery telephone set as installed

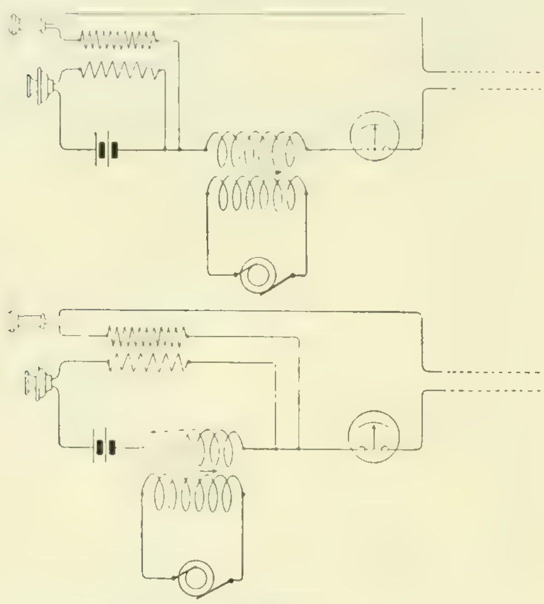


Fig. 3

for commercial practice with the exception that the local battery circuit of the transmitter telephone set was opened, and a few turns of coarse wire inserted in series with the two dry cells which are normally used, as shown in Fig. 3. The armature circuit of the generator was inductively connected with the coil. A hot wire milliammeter was placed in the line circuit to indicate the magnitude of the high frequency current which was flowing on the line. With this arrangement, using the equipment in the regular commercial way with an operator at each end of the line, the direct current voltage and the alternating current voltage in series with it in the primary circuit of the transmitter, were varied individually and relatively in a variety of ways, with the striking result that just at the point where

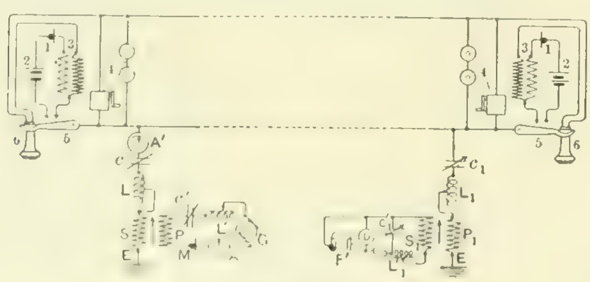


Fig. 4

the direct current voltage was decreased so that no sounds were received, the line became absolutely silent.

As a test under severest conditions the effect was noted upon speech received at the same station at which the high frequency current is being impressed, for here the attenuated telephonic currents at the receiving end of the telephone line, on which is superimposed a high-frequency current of vastly greater magnitude at the same point. No effects of any kind could be detected under these conditions. From the above experiments it appears that in any attempt at multiplex telephony by means of electric waves of ultra-sound frequencies superimposed upon the minute telephonic currents employed in battery transmission there is nothing to fear from disturbances of such currents upon the operation of the ordinary battery equipment.

The actual arrangement of the circuit is shown in Fig. 4, in which G is the source of sustained high frequency oscillations; C′ is the tuning condenser of the oscillatory circuit; L′ is the tuning inductance of the oscillatory circuit; P is the primary of the oscillation transformer; A is the ammeter; M is the transmitter microphone; S is the secondary of the oscillation transformer in the line circuit; C is the tuning condenser in the line circuit; L is the tuning inductance in the line circuit; A′ is the ammeter in the line. At the receiving end of the line C_1 is the line tuning con-

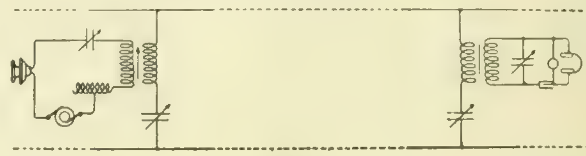


Fig. 5

denser; L_1 is the line tuning inductance; P_1 is the primary of the oscillation transformer; S_1 is the secondary of the oscillation transformer; L_1' is the tuning inductance in the oscillatory circuit; e_1' is the tuning condenser of the oscillatory circuit, between which and the telephone F′ the detector D is operatively connected; E is the earth connection.

The local battery telephone sets are connected across the two line wires in the usual manner. In both sets 1 is the microphone transmitter; 2 is the local battery; 3 is the induction coil; 4 is the ringing system, including the bell and hand generator; 5 is the switch hook; 6 is the telephone receiver.

Duplex Telephone—Using Metallic Circuit

The next step was to remove entirely the earth connections from the metallic circuit and superimpose both telephonic circuits upon the same pair of wires, as shown in Fig. 6, in which the high-frequency apparatus, shown diagrammatically in Fig. 5, is bridged across the line wires A and A′. G is the source of sustained high frequency oscillations; C_1 is the tuning condenser of the oscillatory circuit; L_1 is the tuning coil of the oscillatory circuit; P is the primary of the oscillation transformer; A is the ammeter; M is the transmitter microphone; S is the secondary of the oscillation transformer in the line circuit; C is the tuning con-

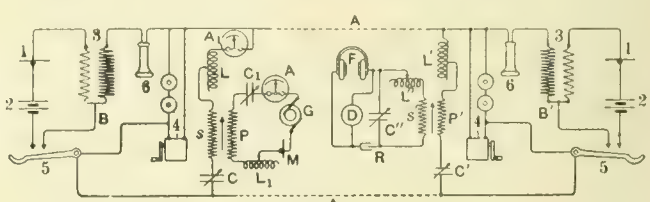


Fig. 6

denser in the line circuit; L is the tuning inductance in the line circuit; A_1 is the ammeter in the line. At the receiving end of the line, C′ is the line tuning condenseer; L′ is the line tuning inductance; P′ is the primary of the oscillation transformer; S′ is the secondary of the oscillation transformer; L″ is the tuning inductance in the oscillatory circuit; C″ is the tuning condenser in the oscillatory circuit, between which and the telephone F the detector D is operatively connected.

The local battery telephone sets are connected across the line wires in the usual manner. In both sets, 1 is the microphone transmitter; 2 is the local battery; 3 is the in-

duction coil; 4 is the ringing system, including the bell and hand generator; 5 is the switch hook; 6 is the telephone receiver.

Articulation tests, including music, numerals and other difficult combinations, gave satisfactory results, with no interference whatever between the two sides of the circuit.

By holding one telephone receiver to one ear and the other receiver to the other ear the receiving operator could hear two entirely different conversations simultaneously over the same pair of wires.

Duplex-Diplex Telegraphy

The paper further states that the problem of transmitting two telegraphic messages over the same cricuit may be solved by methods and apparatus as far as the high frequency side of the circuit is concerned, which are practically identical with those described above.

New Brunswick Telephone Company Annual

The gross earnings of the New Brunswick Telephone Company for the year ending March 31, 1911, amounted to $305,124. Of this sum very liberal allowance was made as follows: operating charges, $74,887; maintenance, $65,172; general, $35,164; reconstruction, $11,305; Campbellton fire loss, $15,708; depreciation, $27,000. This leaves net earnings, $75,885, just sufficient to pay the yearly dividend of six per cent. on $1,176,000 capital, and interest on $100,000 debentures.

The growth of the company's business for the last three years has been at the yearly rate of about 800 instruments, or from 7,536 telephones in 1908 to 9,974 at the present time.

The directors of the company are as follows: S. H. White, president; Hon. F. P. Thompson, vice-president; R. O'Leary, W. B. Snowball, A. R. Slipp, F. B. Black, F. W. Sumner, A. W. Bennett, J. M. Robinson, G. W. Ganong, F. B. Carvell, J. L. McAvity, L. B. McFarlane. A. W. Mackim is secretary-treasurer.

Telephone Company Establishes Ontario Branch

Owing to the rapid expansion of their Canadian telephone business the Stromberg-Carlson Telephone Company has decided to establish an Ontario branch office which will be situated in Toronto at 72 Victoria street, the office formerly occupied by Mr. Beattie, their Ontario sales agent. In the future all standard equipments and their parts will be stocked at this branch and prompt shipments will be made direct from Toronto. Doubtless the customers of the company will find this much improved arrangement a decided advantage in the matter of both time and expense.

The manager of the Toronto branch will be Mr. W. C. Freeman, in addition to which Mr. George J. Beattie, under whom the business has grown to its present proportions, will act in an advisory capacity.

The Bell Telephone Company has let contracts for a new exchange building in Ottawa, corner King Edward and Bessemer streets. The total cost is estimated at $50,000.

1,600 telephone lines from the Main and Parkdale exchanges, Toronto, have been transferred to the new Adelaide exchange. At the same time, 400 telephones were transferred from Parkdale and a few from College to the Junction exchange.

Contracts have been let and the work is already under way for the extension of the Manitoba telephone lines from Asessippi to Roblin, a distance of twenty-one miles. A further extension north to Makaroff, near the Manitoba-Saskatchewan boundary line, is also under consideration.

All C. P. R. train despatching between London and Toronto, London and Windsor, and on the branch lines in that district, is now being operated by the telephone system.

The Nova Scotia Telephone Company has sold out to the Maritime Telegraph & Telephone Company for a consideration which amounts to approximately 144 dollars for each one hundred dollar share of stock held.

Further hearing into the Board of Trade complaint against the New Brunswick Telephone Company has been resumed by the Public Utilities Commission. Dr. H. V. Hays, of Boston, who has been making an inventory of the Company's property, estimates its value at about $1,500,000.

Shipping Cases of Corrugated Paper

The Canadian Independent Telephone Company, Limited, Duncan street, Toronto, have adopted a very up-to-date method in shipping their magneto telephones. Each telephone is in a separate case which is made of corrugated paper. This paper has entered largely into the construction of boxes used in shipping out commodities and it has proven to be particularly adapted to the telephone.

It is light and strong and the telephone is almost entirely free from danger of damage while being handled. To the customers it means that the telephone may be left in the case while it is in store and while it is being carried to the place of installation. The accompanying illustration shows a telephone being placed in one of these boxes. It will be noticed that the telephone is completely assembled ready to go on the wall which saves time and work of installation. In addition the case is very easily opened as there are no nails or screws in it and a jack knife slipped along the top allows the telephone to be lifted out without difficulty.

Questions and Answers

GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.

Electric vs Coal Heating

Q. When is it as economical to use electric current as coal for heating?

A. This question may be answered under the following divisions: 1. When electric current is bought on peak load or on maximum demand and used off the peak, then the cost is for heating appliances only (including maintenance, etc.).

2. When the cost of coal and the cost of electric energy have a relation determined somewhat in the following manner, the quantities assumed being altered to suit the particular conditions.

Assume—1 lb. anthracite coal containing 12,000 B.t.u. 10 per cent. lost through imperfect combustion. 15 per cent. of remainder lost up chimney. Then useful heating from one pound of coal would be,—

$$12{,}000 \times .90 \times .85 = 9{,}200 \text{ B.t.u.}$$

Then as we have 1 B.t.u.=772 ft. lbs. we have from 1 lb. coal an equivalence of

$$\frac{9200 \times 772}{33000 \times 60} = 3.6 \text{ h. p. hrs.}$$

and $3.6 \times .746 = 2.7$ kw. hours.

That is, under the assumptions made, 1 lb. of coal would be about equivalent to 2.7 kw. hrs. or one ton of coal (2000 lbs.) to 5400 kw. hrs. from which we have 1 ton of coal per month equivalent to,—

$$\frac{5400}{30 \times 24} = 7.5 \text{ kw. continuously per month.}$$

Then assuming that power can be bought on the monthly basis, but taking it at a yearly rate as we are more familiar with yearly prices, we have an equivalence of

12 tons coal and 7.5 kw. years.
1.6 tons coal and 1 kw. year.
1 ton coal and .625 kw. years.

That is to say, coal at $5.00 per ton would require electric energy to be sold at $\frac{5.00}{.625} = \$8.00$ per kw. per annum; and proportionately for other prices of coal. As however there are few if any electric plants that could afford to make prices for 3 to 5 months only,—about the limits of time for ordinary heating purposes—it would mean on (say) a 4 month's heating period, that electric energy would have to sell at $\frac{4 \times 8.00}{12} = \$2.67$ per kw. per annum to be equal in cost to coal at $5.00 unless an economic use could be found for the current for the remaining months.

Again we have assumed above that the electric current is used continuously throughout the 24 hours or the equivalent, that it is paid for by integrating wattmeter; but if it is paid for by maximum demand and used irregularly, this puts it at still greater disadvantage.

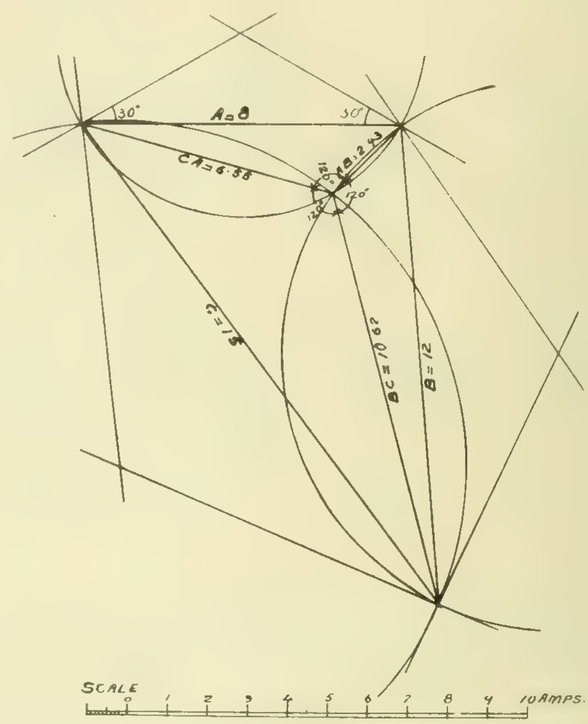
It will not be difficult to apply these results to other cases and there are occasions in the case of hydro-electric power with surplus water during the cold period or of high priced coal, where the conditions become much more favorable to the use of electric current and especially as indicated at first when the current can be used for this purpose off the peak hours of the power and lighting load.

There are of course special advantages of electric heating, in the way of convenience, cleanliness, localization of heating effects, etc., that for special purposes place it considerably in the lead; and the above discussion must be taken as applying more generally to the heating of large air spaces such as the heating of residences or other buildings. E.B.M.

Power on Three-phase Circuit

Q. We have ammeters on the three wires of a 2200 volt, 3 phase lighting circuit. When the three currents are A=8, B=12, and C=15. what power is being delivered?

A. The power in any phase, assuming unity power factor for the lighting load, will of course be the product of voltage and current for that phase. Taking the phase A-B for instance, we have the voltage 2200 between A and B but not the current, as the currents given are interconnected with other phases. The results are obtained graphically as follows:



With unity power factor, the voltages of the three phases being at 120° angles, the currents in the phases will be at the same angles, and as the currents A, B, C form a triangle, (see diagram), we have to find a point from which lines to the three angles will be 120° apart. On the sides draw 120° arcs—by laying off 30° (120°—90°) angles are indicated. These three arcs will intersect in a point, (a check on the accuracy of the drawing) and the lines from this point to the three angles represent the currents of the three phases and scale as shown. The power in the three phases will then be,—

A—B 2.43 x 2200= 5.34 kw.
B—C 10.62 x 2200=23.36 kw.
C—A 6.55 x 2200=14.41 kw.

giving a total of 43.11 kw.

If we had taken the average we would have obtained the total power as $\frac{35}{3} \times \sqrt{3} \times 2200 = 44.45$ kw. showing a considerable error. The former process gives us the conditions in each phase and tells us at once the amount of load to be added to or subtracted from each phase for balancing purposes. E. B. M.

Industrial Progress and Trade Notes

Trade Publications

Gas-Electric Car—Bulletin issued by the General Electric Company, descriptive of their gas-electrically operated motor cars, both single and double truck type. A very full description of every part of these cars is given with good illustrations.

Mazda Multiple Lamps—Bulletin 13A, issued by the National Electric Lamp Association, descriptive of their 100 to 125 volts, 200 to 250 volts, and 25 to 500 watts, drawn wire filament tungstens.

Veritys' Limited—Pamphlets descriptive of the "Aston" interpole motors; Radiant lanterns for metallic filament lamps; the "Aston" steam set; Astral safety fuses, etc.

Outlet Boxes—Catalogue No. 25, descriptive of stamped steel switch and outlet boxes, by the Chicago Fuse Manufacturing Company, of New York.

Magnetic Properties of Heusler's Alloys—Bulletin No. 47, issued by the University of Illinois, describing experiments on the above, by Edward B. Stephenson.

Wires and Cables—Section 7, second addition, supply catalogue, issued by the Canadian General Electric Company, Toronto. A very complete illustrated catalogue of 100 pages, descriptive of the above lines.

The Dayton Fare Recorder—A booklet issued by the Dayton Fare Recorder Company, of Dayton, Ohio, descriptive of their fare recorder apparatus, for use on electric railways.

Bureau of Standards—A circular issued by the Department of Commerce and Labor, at Washington, indicating the range of electrical testing, and the fees for testing electrical and photometric standards, and electrical measuring instruments.

Wiring Formulae and Other Data—A little booklet containing a lot of information about the sizes of wires and cables for various uses, such as conduits, motor and generator leads, etc., published by the Conduit Machine Company, 5th Avenue, New York.

Time-Switches—A catalogue issued by Venner & Company, London, England, descriptive of the Venner time-switch. The construction and operation of the apparatus is very clearly indicated by diagrams and descriptive matter.

Meters—A catalogue issued by Venner & Co., London, England, descriptive of the Chamberlain & Hookham meters, for which they are selling agents.

Mazda Multiple Lamps—Bulletin 13A, issued by the Engineering Department of the National Electric Lamp Association, giving full technical data on the recent perfection of a process permitting the use of drawn tungsten filaments. It is claimed that this new construction greatly diminishes a fragile nature of the tungsten.

F. J. Drake & Company—Catalogue of practical books on various phases of the electric art. F. J. Drake & Company, Chicago.

Korting Engines—Two catalogues issued by K. Lindemann, 204 St. James street, Montreal, descriptive of Korting's Horizontal Diesel Engine, and Korting's 4-cycle Gas Engines.

Monthly Record of Scientific Literature—published by the D. Van Nostrand Company, publishers and importers of scientific, military, and naval books, New York city.

Columbia Cut-Out Boxes—A pamphlet issued by the Columbia Metal Box Company, New York, descriptive of their "Enny-Size" sectional cut-out boxes. Also catalogue No. 4, dealing with the Columbia Panel Board Push Button, and Knife Switch cabinets.

Detroit Switches.—The Detroit Fuse and Manufacturing Company, Detroit, Michigan, is distributing Bulletin No. 21 on "Detroit" switches, and Bulletin No. 22 on "Arkless" fuses. These bulletins give complete prices and information on these lines and will be found of great interest to fuse and switch buyers.

"Practical Operation of Arc Lamps," edited and published by the National Carbon Company, of Cleveland, Ohio. It contains 76 pages of practical and helpful points regarding every phase of arc lamp construction and operation. Its numerous illustrations are marked and keyed in such a way that they work in closely with the article and make it easy for any lamp man to understand the points brought out in the text. A copy of the book will be sent free to any one connected with the construction, operation, or maintenance of arc lamps of any form, upon request.

Agents, etc.

542. **Electrical insulators in stoneware and porcelain, &c.**—Inquiry is made by a well known London firm manufacturing electrical insulators in stoneware and porcelain; also conduits, troughing, cable racks and floor tubes, etc., for power stations and for the names of Canadian importers.

Three Manufacturing Firms Merged

The advertisement of the Oshkosh Manufacturing Company, succeeding the Oshkosh Logging Tool Company, the A. Sanford Logging Tool Company, and the Oshkosh Tool Manufacturing Company, as shown in this issue, involves a progressive story of two companies which have been competitors in the tool business for many years. The A. Sanford Logging Tool Company was started in a small shop in 1853, and at that time had the field practically to itself. Soon after it took into its employ Mr. Elmer Leach, who stayed with the Sanford company until 1885, when he started the Oshkosh Logging Tool Company, taking in with him Mr. C. Nygaard, the general superintendent of the new factory. The new company had a hard struggle to get a start, having scarcely enough capital to build a small shop and buy material for tools. But the persistent spirit of the promoters which has made "Oshkosh" tools a success, slowly but surely brought the new company before the attention of the public.

The A. Sanford Logging Tool Company stuck almost entirely to labor-saving tools and devices for lumbermen, the Oshkosh Logging Tool Company making more of a specialty of time, money and labor saving devices for telephone, telegraph and railroad lines and contractors, in which field its tools have become known everywhere. All three of these companies had men on their payroll whose principle duty was to perfect new time-saving inventions, and with the consolidation of the three, it gives the new company a force of experienced perfectors and manufacturers who thoroughly

understand the business in which the tools are to be used. A short time ago the company put up a large factory and equipped it with special machinery, much of which was designed by its own men.

British Meter Company Opens Canadian Office

Messrs. Chamberlain & Hookham, Limited, of Birmingham, England, one of the oldest and largest manufacturers of meters in the United Kingdom, sent one of their directors, Mr. Sharp, to Canada in the beginning of the year to investigate the opportunities for business. Mr. Sharp was so impressed with the possibilities that he recommended his board to form a subsiduary company for the sale of their specialties in Canada, in preference to appointing agents, as he considered that only by this means could his firm do justice to the Canadian business and to themselves. The board having decided on accepting his advice, Mr. Sharp will return to Canada in August, together with the gentleman who will be appointed their Canadian manager, and arrangements will then be made to open an office and stores in Montreal, where a large stock of meters will be kept.

It will interest our readers to know that this firm are pioneers in the meter business, Mr. Hookham having introduced the mercury motor meter over 25 years ago. The success which has attended these has been such that this type of meter may be said to have become standard practice in England, and is showing signs of becoming so even in Germany, the home of commutator meters. Many years back the firm were making induction type a.c. meters, but the type then put forward was only suitable for the non-inductive loads which were then the rule. More recently they have brought out an improved meter which is suitable for modern conditions, and has the largest torque and ratio of torque to weight, of possibly any induction meter in the world. As a result the starting current is extraordinarily

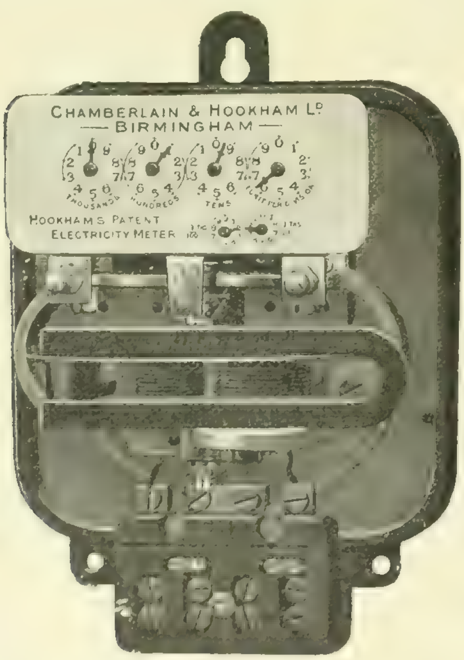


Fig. 1

low, being guaranteed at one-quarter per cent. of full load and usually being more like one-eighth of full load. The curve of accuracy on varying power factors, frequency and voltage is extremely good and as an instance of this, it may be mentioned that a 200 volt meter remains correct even at 100 volts, an important point in reducing stock for stations who have the two voltages in use.

Besides ordinary meters the firm supply a simple prepayment meter, two-rate meters, car meters, and in fact every type of integrating meter. Fig. 1 shows a view of their a.c. house service meter; Fig. 2 is a view of a Venner Time Switch, which will also be supplied by this Canadian company. Meters can be supplied with either ordinary or cyclometer counters, as desired, the latter being of the springing figure type so that there can be no mistake about the readings.

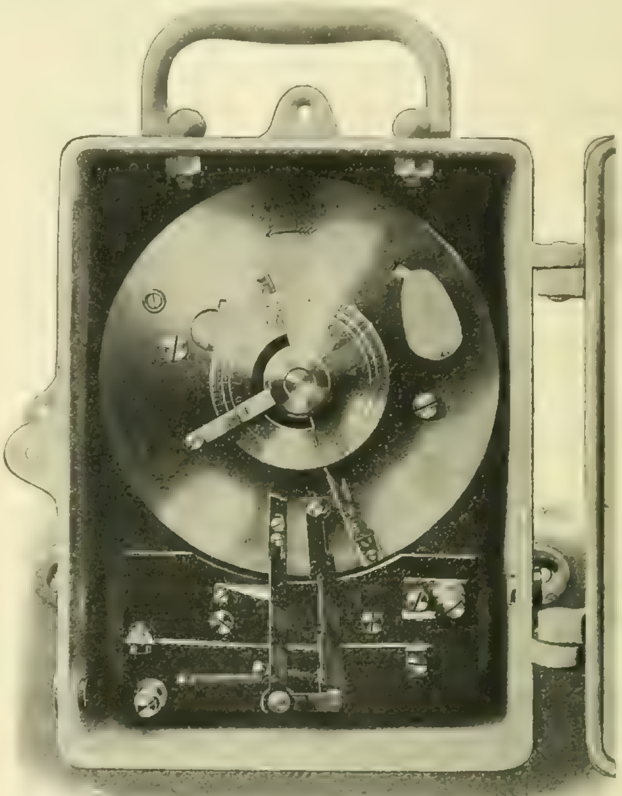


Fig. 2

Time switches can be supplied for either two-rate meters, street lighting, shop window lighting, or in fact for any purpose where automatic switching is desired. The type illustrated is that used for two-rate meters.

Electrical Decorative Specialties

Messrs. Solomon & Spielmann, 22 St. John street, Montreal, deal in electrical decorative specialties and have made investigations into the merits of the different makes of paint, enamel and coloring materials. Any paint to be used on metal should be free from all substances that could have any injurious effect upon it. Such paint also must be impervious so far as possible to all external influences; and it must be sufficiently elastic to allow for the expansion and contraction of the metal under varying temperatures while at the same time not liable to rub or peel off. For a number of years "Ferrodor," handled by this company, has been used for painting railway bridges, light houses, iron and steel ships, grain elevators, fortifications and an endless variety of smaller structures—and has stood the test. It will adhere to zinc, a quality possessed by very few brands of paint. It has the power to withstand the action of acids and mineral waters, necessary in connection with ocean vessels and mining machinery. This firm has also obtained the sole agency in Canada for "Armour" liquid and "Armour" paint. These articles possess fire resisting and non-poisonous qualities and may be applied to wood, plaster, cement, and fabrics. "Driorol" is another of this

firm's lines. This is an elastic enamel suitable for use on electric cars and other vehicles. It dries rapidly, is absorbed evenly and preserves its glossy finish after being cleaned with either oil or water. Other lines handled include "Olmaline," an insulating composition, and "Shaydolite," a liquid used for coloring electric bulbs and other glass.

Replenishing Their Stock

The electrical dealers in Montreal have recently received calls from the following:—C. W. Bongard, Toronto; T. Price, Sunbeam Lamp Co., Toronto; J. A. Johnson, of C. H. L. Keeler Company, Toronto; D. Irving, of Chapman & Walker, Toronto; Mr. Craymer of The Chicago Fuse Mfg. Co., Chicago; Mr. Hall of Conduits Limited, Toronto; S. B. Condit of Boston; Mr. Perkins of M. B. Foster Co., Boston; Mr. Siegel of Haskins Glass Co., Wheeling, W. Va.; Mr. McCullough of J. H. White Mfg. Co., Brooklyn, N. Y.; J. Trumbull of The Connecticut Electric Co., Bantam, Conn.

The Eureka Vacuum Cleaner

Nothing has done more towards reducing the labor involved in keeping the modern house as it ought to be, than the development of the household vacuum cleaner—especially the electrically operated cleaner; for while hand operated machines may prove fairly satisfactory in some instances, the labor involved in operating may be as great or greater than that imposed by older methods. One drawback of the electrically operated cleaner has hitherto been the price, and expense of current for operating, which have placed cleaners beyond the reach of all but the fortunate

few. An electrically operated vacuum cleaner has recently been placed on the market which is comparatively moderate both in first cost and expense of operating. This is the "Eureka," which is already on sale both in the United States and Canada. The "Eureka" is claimed to be no more bulky or difficult to handle than the ordinary carpet sweeper, and to be so small and convenient that it will go into nooks and crannies that would defy any other arrangement. At the same time the current consumption is small, only about one and one-fifth amperes; this means low cost of operation, and also that attachment can be made to ordinary lighting fixtures in a room—special wiring is not necessary. The distributing agents for the Dominion of Canada are the Radiant Electric Manufacturing Company of Toronto, whose advertisement will be found on another page.

British Columbia and Idaho Red Cedar Poles

By B. F. Vreeland, President of the Western Lumber & Pole Company

When a firm reach the point of buying poles they have not always made up their minds as to what kind they should purchase, but if for street work, they naturally drift toward the Western Red Cedars on account of their straightness and fine appearance, as is shown by the following cut, which was made from a photograph taken at Denver of a carload of 108 35 ft. 7 in. top Idaho cedar poles while en route to Fort Worth, Texas.

It is an undisputed fact that the British Columbia and Idaho cedars make the "sightliest" poles in the world. They have great flexibility, very thin sap, are extremely sound and trim, almost as straight as a rifle barrel, and make an elegant appearance in the line. While on the other hand the North Michigan and Minnesota white cedars are more or less crooked and unsightly, and on account of the white cedar tracts having been cut over time and again, only the poorest remains, and then principally the shorter lengths, 20, 25 and 30 feet.

Another item that attracts the buyer to western cedar is the price—especially on lengths 35 ft. and 40 ft. and longer, as the western cedars grow high—they reach out towards the sun—thus giving the eastern buyers "the call" on the longest lengths they are able to use, as 45, 50, 55, 60 and 65 ft. are common lengths with us, while we have shipped to New York state from Idaho full double and triple loads of 70 and 75 ft. poles, all with 8 inch tops.

But talking about long poles:—The president of the Colorado State Agricultural College at Ft. Collins, Colo., called on us one day and said he wanted a cedar flag pole. We told him we were in the business—to specify his requirements—which he did—naming 110 ft. long, 6 in. diameter top. We booked his order, guaranteeing delivery within six weeks, as we had just the day before mailed our Idaho superintendent an order for a triple, on top of which we knew he could load this pole. In about 10 days we received shipping tickets, every pole loaded just as ordered with the 110 ft. flag pole on top. The actual pole was 114 ft. long, 6¼ in. top, 23 in. butt; afterwards cut back 4 ft. to exactly 110 ft. A glance at our "ad." on another page of this issue will give you an idea of the length of the pole, as it is shown on top of the load over three 41-foot flats. This only to show what we can do if pushed.

But now a word in reference to the consumers' interest. It has been estimated that fully 90 per cent. of pole-line troubles are due to decay at the ground line, and not to

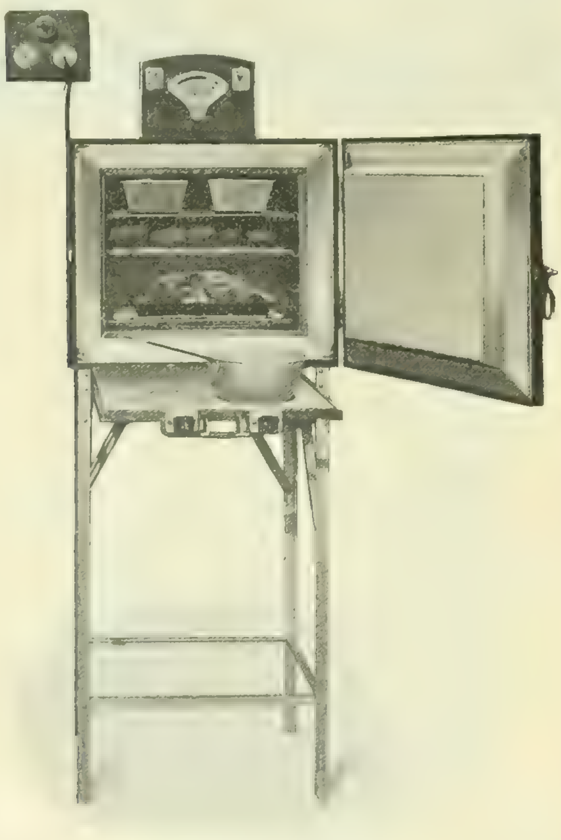
actual breakage, and while we know that cedar poles are longer lived than any other kind, they, in time, will decay at the ground line. At the same time the life of the pole can be materially extended by a simple brush treatment (2 coats) from the butt up to a point about 1 foot above the ground line with the genuine imported "Avenarius Carbolineum." We sell and deliver this standard German wood preservative to any point in Canada or the States.

Our pole shipments reach out all through the States, covering also points in Alberta, Saskatchewan, Manitoba, Ontario and Quebec. We have already supplied about 150 cars for the Hydro-Electric Power Commission's lines throughout Ontario, with shipments still going forward.

We are the "pioneers" in the western cedar poles business—started in 1897—14 years in the business—now have 24 cedar yards in British Columbia and Idaho, and have yet to receive an order we could not or did not fill.

The Automatic Electric Cooker

The accompanying cut illustrates a new electric cooker just being placed on the market by the Automatic Cook Company, Adelaide street, Toronto. The cooker is a clever combination of an electric heater with the so-called fireless cooker idea. The oven is constructed in such a way as to retain heat for a long period and an automatic ar-

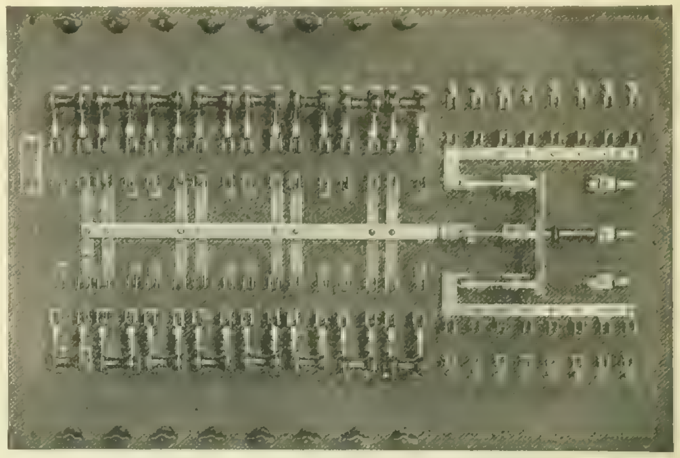


rangement makes or breaks the current so as to keep the temperature at any desired point. This automatic device works out very economically for the consumer and also precludes the possibility of overheating the oven—a common fault in cooking.

Recent tests with this cooker demonstrate its ability to compete on equal terms with gas in the matter of cost of cooking and it is expected that when some anticipated improvements are completed the argument will be in favor of electricity. The improved flavor of the food cooked in an electric oven is also a strong argument in its favor.

"Nico" Metering Panel

This is a panel by which it is possible to meter any or all of the circuits on a floor or section of a building at one time. The panel resembles an ordinary panel board with the exception that the base is carried out under the side linings and on this extension is placed an isolated insulated termin-



al for every circuit on the board. This terminal is connected to one side of circuit switch in such a way that the fuse is in the line. At the side of the main terminals are arranged meter loops, one for each circuit. If used in connection with slate frames and gutter covers, the meter connections are removed from sight and are inaccessible to anyone except the duly authorized person, and can, therefore, not be tampered with. The mere transposition of a fuse, stud, screw, or anything else on the working portion of the board, whether by accident or design, cannot in these boards change one or more circuits from one meter to another. It can only be done by the party having access to the wire space. The panels are manufactured by the L. H. Nielson Company.

"Simplex" Establishes Fifth Branch

The Simplex Electric Heating Company, of Cambridge, Mass., announce a new Canadian office. This office, the fifth branch to be established by this company, has been located in Belleville, Ont., with a view to giving quick service on shipments both to the eastern and western provinces of the Dominion, as well as to Toronto and vicinity. The Simplex line embraces practically every known type of electhic heating apparatus for domestic and commercial use. The office is in charge of MacAllaster Moore, formerly assistant to the general manager, Mr. James I. Ayer, and is equipped to give prompt attention to engineering problems as well as to commercial business.

New Home of Electric Service Supplies Company

The Electric Service Supplies Company have moved into a fine new office and factory building situated at 17th and Cambria streets, North Philadelphia. The building is a six-storey, monolithic, reinforced concrete, absolutely fireproof structure; the company states that this is the first of a group to be erected on this site, as their business expands. The location of the present factory is said to possess almost unequalled shipping and transportation facilities.

The town council of Verdun recently voted $5,000 for electrical extension and $2,000 additional for fire alarm boxes and rewiring.

Gas Electric Plants Operate at Low Cost

The H. W. Petrie Company, sole Canadian representatives of the Keighley Gas & Oil Engine Company, state that in the average factory, providing for a peak load of 50 h.p., and equipped with a 50 h.p. Keighley suction gas plant, with electric generator for lighting, all operating under average normal conditions, yearly cost, including interest on first cost, coal, water, oil and attendance—should not exceed a total of $500, or a flat rate of $10 per h.p. per year. In the city of Toronto there are now 10 Keighley plants of approximately the above-mentioned size, five operating on city gas, and five on suction gas. Special hot water or steam attachments in connection with these plants will effect another saving, as only the waste heat is utilized for this purpose. It is calculated that a Keighley engine using city gas at 70 cents per 1,000 feet, will furnish power at a cost of approximately 1½ cents per kilowatt hour

The Stuart-Howland Company

The Stuart-Howland Company, of Boston, is one of the largest electrical supply houses in the United States. Its progressiveness is shown by the fact that though only eleven years old it is now among the largest jobbers of electrical material on the continent, and by the extent of territory covered with its large corps of travelling salesmen. In its warerooms, which are large and commodious—having 13,000 square feet on a floor and a frontage of about 300 feet—it carries a large stock of practically everything generally called for by central stations, isolated plants, street railways, telephone exchanges, dealers or contractors. The facilities for handling goods quickly and economically are of the best. In addition to its large buying power because of the quantity of material purchased, this company is exclusive selling agent for many manufacturers of various lines, including cross arms, pins, pole line hardware, porcelain insulators, rubber covered and lead encased wires, enamel, fireproof and cotton covered magnet wires, rigid and flexible conduit, knife saws, switch and panel boards and many other specialties.

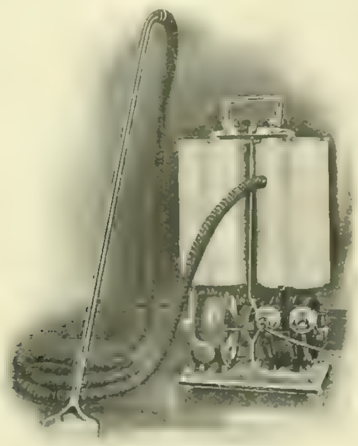
Business Increases Require New Branch

Owing to the rapid increase in business, the Canadian H. W. Johns-Manville Company, Limited, have opened a new branch at 450-452 St. James street, Montreal, where they have a five-storey building, and are carrying a full stock of all their electrical specialties. They state that they will now be able to make immediate shipments of all their standard goods. Mr. Chas. B. Ellis, late of the Manhattan Electrical Supply Company, of New York city, is in charge of the electrical department.

The D. P. Battery Company, Limited, Bakewell, Derbyshire, Eng., announce that they have been successful in securing the contract for the new battery at Hindhead central station.

Onward Vacuum Cleaner

The accompanying cut represents the electric vacuum cleaner manufactured by the Onward Manufacturing Company, of Berlin, Ont. Lightness, power, beauty and noiselessness are claimed for this cleaner. It carries a positive



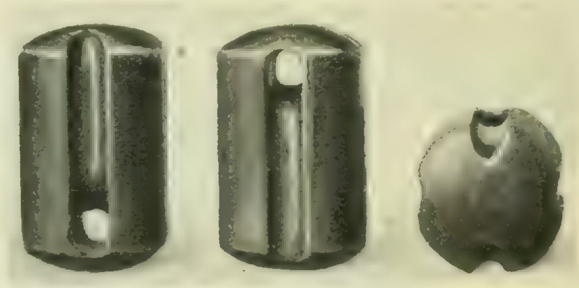
rotary pump which insures an even suction. The power of the motor is one-eighth horse power, which may be safely taken from any lighting socket. The dirt is caught in two metal separating tanks, so no dust can reach and destroy the motor.

Venturi Meters for Toronto

The City of Toronto Waterworks Department recently purchased from the John McDougall Caledonian Iron Works Company ten Venturi meters ranging from 12-inch to 36-inch in diameter. These meters are a necessity for all turbine pumps and almost a necessity for reciprocating pumps in order to check up the slippages and other irregularities. One of these Venturi meters now in operation in the city of Montreal has a diameter of 108 inches, a range between 30 and 75 million imperial gallons per twenty-four hours, and at the present time is measuring the supply of the Montreal pumps of an average pumping capacity of 42 million imperial gallons per twenty-four hours.

Westinghouse Porcelain Strain Insulator

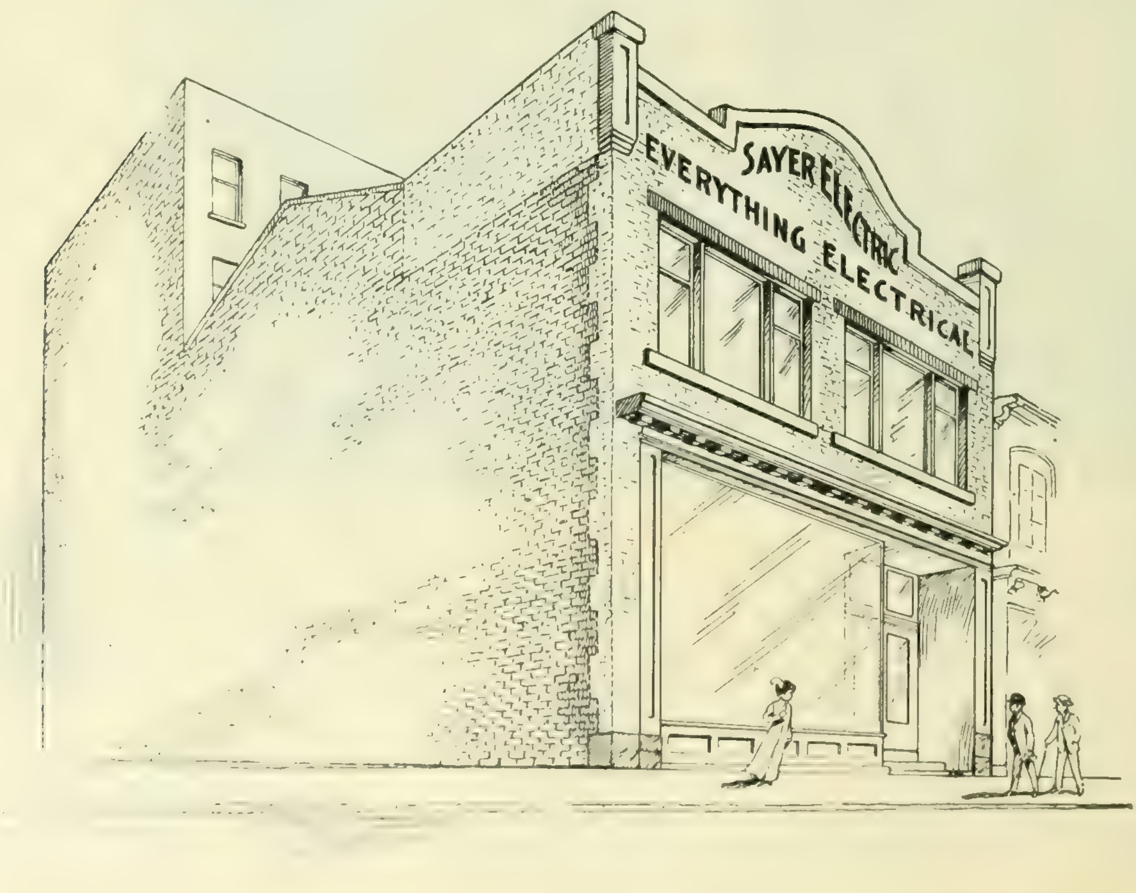
There are many conditions for which properly designed porcelain strain insulators are admirably suited. For example, they are largely used in guy wires by street railway and electric power companies; or groups in series are used at dead ends to take the strain off and to insulate the line wires. Westinghouse form P2 porcelain strain insulators are made of a grade of porcelain superior to that ordinarily used for such appliances. Sharp corners that would be apt to chip have been avoided and the shape of the grooves is such that the wires lie naturally in them. The break down



voltages when the insulators are dry is about 20,000 volts for each of three sizes. The approximate ultimate tensile strengths of the insulators, when wired up in guy wires, are respectively 14,000 lbs., 16,000 lbs. and 23,000 lbs.

Sayer's New Building

We illustrate herewith the new home of the Sayer Electric Company, Montreal. Here they will occupy all of the first three floors and basement for offices, stores and warerooms. This move is the culmination of ten years of energetic perseverance on the part of the founder of the business, Mr. E. W. Sayer, who is now justly proud of the prominent place his business name holds in the electrical retail world. In addition to electrical novelties and supplies this firm carries a large variety of manufacturers' fixtures and has just completed the installation of the equipment for Goodwin's departmental store, as well as other considerable orders.



New Company to Manufacture Heating Devices

Owing to the increased demand for electric heating devices, for domestic use, the Electrical Specialty Manufacturing Company, of Vancouver, B.C., is under formation for

the purpose of manufacturing portable electric cup fluid and cooking heaters, also barber heaters, printers' gluepots, melting pots for babbit, lead, etc., and kindred objects. For this purpose they have secured a valuable patent right covering a principle which is claimed to give high efficiency and long life. The application of electric energy in this principle is based upon area. Instead of having an electric pad, upon which a cup of water can be set to boil, from which the cup only receives its heat from the bottom, the cup itself is wound circumferentially as well as non-inductively in a special cement, so that the water not only receives its energy from the bottom but from the sides as well. As the sides are approximately three times the area of the bottom, it is seen where the claim for efficiency arises. A cut of the cup is seen in the accompanying illustration.

Personal

Mr. James Hutchison, president of the West India Electric Company, Limited, Commercial Union Building, Montreal, has just returned from Jamaica.

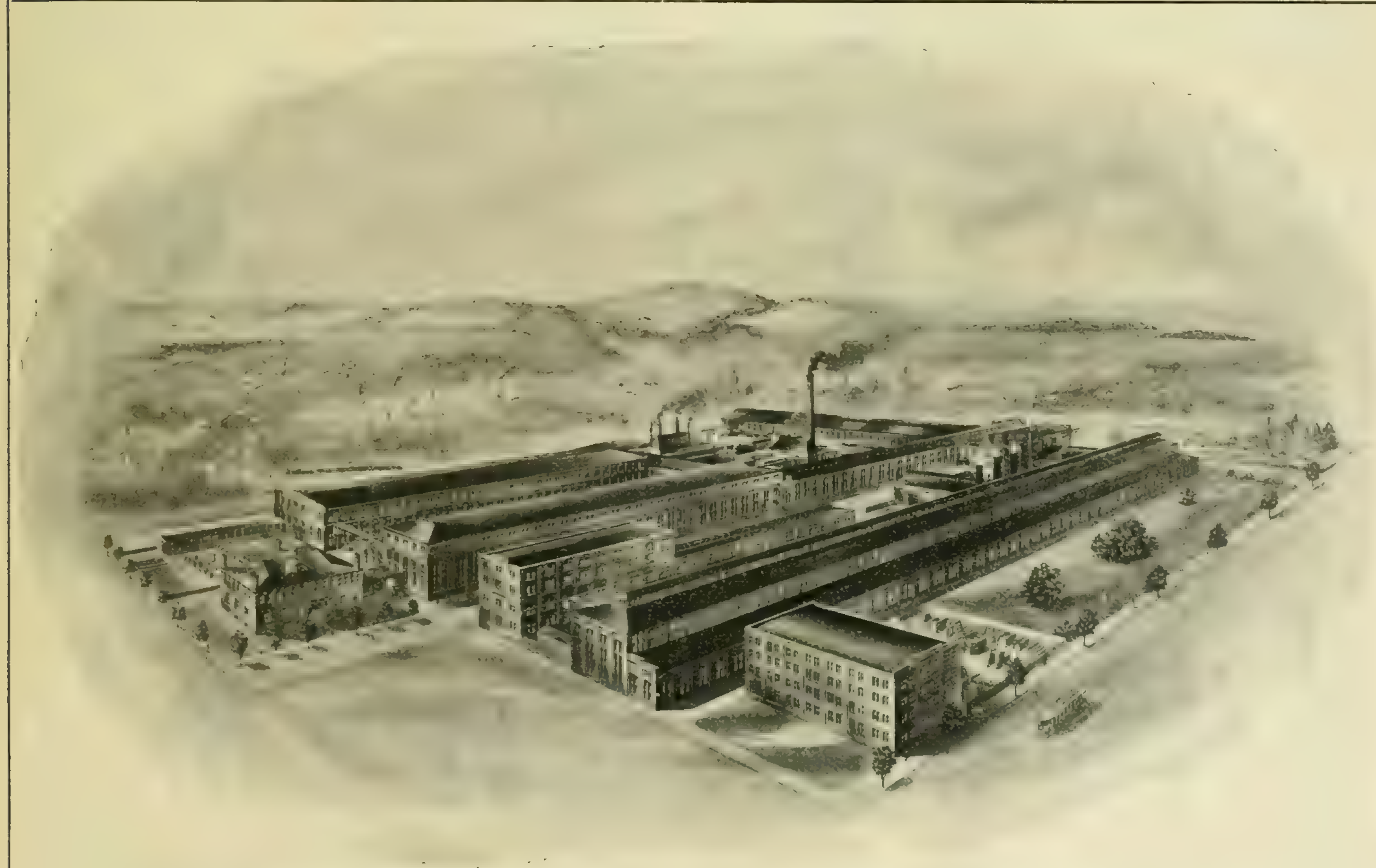
Mr. E. J. Philip, who has been superintendent of the light and power department of Berlin for the last four years, has tendered his resignation to the Berlin Light Commission to take effect July 1st.

Mr. H. V. Mooney, of the Mohawk Electric Company, of Albany, N.Y., was in Montreal recently paying a visit to the company's Montreal branch, 301 St. James Street. Mr. A. G. Manly is the local representative.

Mr. Harry Crerar, electrical superintendent Canadian Tungsten Lamp Company, has returned from Europe where he spent a couple of months experimenting with drawn wire tungsten filaments. The experiments are said to have been highly successful.

Mr. A. L. Woolf, for many years a familiar figure on the road, has been appointed manager of the Winnipeg branch of the Canadian Tungsten Lamp Company. A large and spacious warehouse has been opened on 56 Albert street where Mr. Woolf will be glad at all times to welcome any of his Western friends.

Mr. Chas. A. Howe, who for ten years past has been connected with the Holoplane Company, as manager of their Chicago office, is now located in Toronto, as general manager of the Canadian Telephone Company. In Chicago Mr. Howe took an active interest in electrical happenings, having been vice-president of the Chicago Electric Club and a prominent member of the Illuminating Engineering Society.



Factory Buildings of the S. Morgan Smith Co., Turbine Manufacturers, York, Pa.

Current News and Notes

Berlin, Ont.

The Light Commission has decided to ask the ratepayers for power to issue additional debentures to the amount of $20,000 to increase the capacity of the light and power plant. During the past year twenty-two new motors have been installed with a capacity of over 200 horse power and this, with the business which promises during the present season necessitates the expenditure of the sum mentioned.

Brandon, Man.

A by-law for $25,000 for the purpose of laying rails for the street railway on the streets to be paved will be submitted. City Engineer, Speakman.

Brockville, Ont.

A revision of the by-law so as to permit the construction of electric signs overhanging the streets is under consideration.

Brantford, Ont.

Tenders are called by Engineer W. P. Kellett, Brantford, until August 1st for construction and equipment for the Brantford & Port Dover Railway. Length, 30¼ miles; steel towers (6,600 volt, single phase); five large bridges. Surveys made.

Canora, Sask.

By-laws aggregating $100,000, for waterworks and electric light, have passed the council, and will shortly be submitted for approval.

Carmangay, Alta.

The town council have taken an option to buy the electric light plant together with ten acres of ground, and other property from Mr. Carman. The price for the property and plant combined is $6,000.

Calgary, Alta.

Power from the Calgary Power and Transmission Company's generating station at Horseshoe Falls was turned into the city's lines on Sunday, May 21.

The Alberta Electric Railway will be a distinct advantage to Calgary in that this city will, during the next three years have a complete electric railway line between Medicine Hat and Banff, with Calgary as the main seat of operations. This railway will be operated by the Alberta Electric Railway company recently incorporated; capital, $10,000,000. Work will commence on the proposed new road at once. This section of the line will be 79 miles in length.

Mr. Geo. E. Wood, the manager of the Alberta Electric Railway Company, which proposes to build from Medicine Hat to Banff, through Calgary, with branches to McLeod and Taber, states that the motive power will be gasoline engines of 350 h.p. capacity.

Tenders for feeder voltage regulators were as follows: Type I. R. T., C. G. E., 60 cycles, 300 amp., hand operated, $1700; motor operated, $1825; Canadian [illegible] 60 cycles, 200 amp., 35 k v.a., hand operated, $1245; motor operated, $1530. Tpye I. R. S.; C. G. E., 60 cycles 300 amp., hand operated, $875; motor operated, $1,000; Can. Westinghouse, 59 k.v.a., 300 amp., 60 cycles, hand operated, $2150; motor operated, $2430. Automatic motor operated type; C. G. E., $1950.

Mayor Mitchell states that the negotiations with the Eau Claire Company and the Calgary Water Power Company regarding the purchase of the electric light plant and other holdings of the joint company are still in progress.

The city of Calgary have closed contract with Laurie & Lamb, Engineers, Montreal, to construct a Heenan & Froude incinerator, capable of destroying 75 tons of the city garbage per day.

It is possible work on the new Chestermere Lake railway will commence within a month. A meeting of the Chestermere Lake Electric Railway Company was held recently and $175,000 was promised in stock subscriptions and right of way, by some of the landholders between this city and the lake. After this favorable meeting it was decided that no time should be lost in starting work.

Comox, B.C.

Tenders addressed to W. L. Coulson, general manager, will be received until June 26th for supply of Hydro-electric equipment for the Canadian Collieries, (Dunsmuir) Ltd., Puntledge River. Contract includes complete hydraulic and electric equipment, furnishing and installation of two direct connected units, each unit developing 3,750 k.v.a. at switchboard. Plans at office of company, Pemberton Block, Victoria.

Tenders also received until June 26th for construction in connection with development of power, including clearing, construction of dams, flume, pipe line and power house.

Edmonton, Alta.

During May 487,348 passengers were carried, while the estimated income for the month is placed at $20,389.40. Twenty-one cars are started at rush hours and this number will be increased to thirty when the new cars arrive.

The proposition of a municipally owned gas plant will be placed before the ratepayers shortly.

Fort Frances, Ont.

The clerk of the council has been instructed to write to the Board of Railway Commissioners, Ottawa, making application for them to set a price on 15,000 h.p. for hydraulic and electrical energy.

Fort William, Ont.

Net earnings for the month of April were $4,675, as compared with $2,851. The year before gross earnings for April were $12,352. Gross earnings per car mile amounted to 23.672 cents; net earnings per car mile, 8.961 cents. Manager Robinson states that 80 lb. rails will be installed between the twin cities this summer.

Galt, Ont.

The Grand Valley Railway Company, Superintendent Mr. J. P. Verner, will install a new transformer station near here and it is said will use Niagara power.

By a vote of 224 to 107 the by-law submitted to authorize the expenditure of $25,000 for the extension of the Hydro-electric system was passed. The money will be used for installing additional house lighting services, providing equipment to serve the manufacturers with power and extending the street lighting.

Guelph, Ont.

The new tungsten street lighting system has now replaced the old arc lights.

The street car men of Guelph have been given a voluntary raise of $35 a year in pay. This brings their weekly wages up to $12.25.

Hamilton, Ont.

Labor reports state that a by-law will shortly be submitted to provide for $500,000, for power and light distribution plant.

The Dominion Power and Transmission Co. are considering the construction of an electric line to Galt. Mr. Hawkins, manager.

E. J. Sifton, the engineer appointed by the city of Hamilton to report on the advisability of installing a municipal distributing system advises the expenditure of somewhat over half a million dollars as follows: Conduit (underground) service, $95,375; estimated cost of services from same, $3,200; cables, drawing and splicing, $48,980; primary wood pole distribution, $29,994; sub-station and equipment, $54,450; line transformers, $14,500; meters, $15,750; high tension interswitching station, $5,300; concrete distribution poles and lights, $99,540; iron 5-light ornamental tungsten standards, $30,000; iron 1-light ornamental tungsten standards, $6,220; establishment expenses, $62,350; secondary wiring and street lights, $26,544; secondary wiring, residense lights, $8,000; secondary power service lines, $3,675; total, $502,878.

Hull, Que.

The Hull Electric Company intend to erect car sheds, repair shops and offices for their railway at a cost of $25,000, on their property near the Hull Junction (Ottawa and Gatineau Valley station) in the Little Farm. Plans for the buildings, which will be constructed of brick, with all modern improvements, will be presented to council by Mr. Chene, city engineer.

London, Ont.

The work on the installation of the ornamental street lighting system is being rushed by Engineer Glaubitz and may be completed by the middle of June

The commissioners have already a legal suit for $13,000 on their hands and are threatened with another for $9,000. The former is in connection with the Horton street station, the latter with

a company that supplied electrical apparatus.

Lindsay, Ont.

A by-law submitting the agreement between the town and the Light, Heat & Power Company regarding the purchase of the local power plant will be submitted to the people. The purchase price of the private plant is $30,000.

Middleton, N.S.

A by-law is under consideration to provide $15,000 for the purchase and installation of an electric light plant.

The electric lighting plant here will be constructed this summer. 100 h.p. steam boiler and engine will be installed. Ratepayers have voted appropriation. Estimated cost, $15,000.

Minnedosa, Man.

Tenders addressed to H. F. Maulson, P. O. box 369, Minnedosa, will be received until June 15th for construction of the power station foundation and penstock and the spillway and intake structures. Plans, etc., at office of Messrs. Taylor, Colwill, barristers, Portage la Prairie; and at the office of the secretary of the company, Minnedosa.

Moncton, N.B.

R. W. Whelpley, Moncton, has been awarded the contract for excavating the main pipe line for the natural gas between the wells and Moncton.

Montreal, Que.

The Canadian Light & Power Company is supplying the new mill of the St. Lawrence Flour Mills Company with 1,000 horse power.

It is said that electric power will enter very largely into the equipment of the new naval works and floating dock which are to be constructed in Montreal on behalf of the Harbor Commissioners by the English firm of Vickers Sons & Maxim.

The Pay-As-You-Enter Car Corporation announces the issuance of patents Nos. 800,172 and 875,740 for China. Part of the funds to come from the important loans now being arranged for in Europe will probably be used to open up new traction lines in the Chinese Empire.

The Board of Control will submit a report on the advisability of having an elevated railway along Craig street.

Moose Jaw, Sask.

The by-law to raise $7,500 for ornamental lights was carried; also that for electric light system, $35,000.

Somerville and Ilson, Regina, have the contract for construction of rural telephone line at $56 per mile.

The city of Moose Jaw have closed contract with Laurie & Lamb, Engineers, Montreal, to construct a Heenan & Froude incinerator, capable of destroying 25 tons of the city garbage per twelve hours.

Contracts for equipment for the power house were awarded as follows: To the Babcox-Wilcox Co., boilers at $5,975, stoker at $2,000, piping at $375, tee bars and supporting flue, $200

Nanaimo, B.C.

A communication was received by council from Messrs. Stewart and Rogers, of Victoria, offering to install a tramway system in the city without a bonus from the council, to commence construction within four months from date of franchise and to complete the same within a period of twenty-four months. Referred to the council tramway committee. A similar proposition has also been submitted by another syndicate.

Bird & Darling, solicitors, on behalf of a local syndicate, have applied for a franchise for a street railway.

Niagara Falls, Ont.

Tenders addressed to J. Robinson & Sons, Niagara Falls, will be received until August 1st for the following electrical equipment: lathe, drill press, shaper, electric rectifier.

The Canada Iron Corporation, Montreal, have under construction in connection with their iron mines at Torbrook a washing plant to cost $75,000, and an electric water power plant to cost about $70,000. E. M. Archibald, engineer.

North Toronto, Ont.

The demonstration which was planned for July 1st to celebrate the turning on of the new lighting system has been postponed until August 7.

Nelson, B.C.

Application has been made by A. L. McCulloch, mining engineer, to W. F. Teetzel, water commissioner for the Nelson water district, for a license to use 6,300 cubic feet of water per second for power purposes, from the Kootenay river. The water diversion is for power development at Granite rapids, four miles below this city, where a fall of about 16 feet is available.

New Westminster, B.C.

Heavy iron gates are being placed on each side of the New Westminster draw bridge. These are electrically operated by the man in the tower and are so arranged that the bridge cannot be opened until the gates are closed and vice versa.

Ottawa, Ont.

Hon. Mm. Harty, owner of Chats Falls, near Ottawa, is reported to have stated that he is not desirous of disposing of his property by sale but would lease to the city of Ottawa for a term of years.

The rates for residential lighting have been reduced by the city service and now stand at 4 cents per month per 100 feet of floor space plus three cents per kilowatt hour, less ten per cent. Power in amounts exceeding 100 horse power will cost from $25 for 24 hour service down to $16 for restricted service, ten per cent. discount allowed in each case.

Orillia, Ont.

It is proposed to connect the power development at the Big Chute with the municipal plant at Ragged Rapids so that the town may have a sufficient supply of power at once so that undue haste need not be used in the construction of the new plant. A line ten miles long would be required. It is also pointed out that such a line would enable each power plant to act as an auxiliary to the other in case of an accident in either power house.

Prince Albert, Sask.

Bids will be received until June 26 by C. O. Davidson, secretary-treasurer, for hydraulic power and electrical power equipment at La Colle Falls Power Station. C. H. & P. H. Mitchell, Engineers, Traders' Bank Building, Toronto, Ont.

Pincher Creek

A street railway for this town and connecting with Pincher station is a possibility of the near future. It will probably be constructed and operated by the municipality.

Porcupine, Ont.

E. A. Walberg, president of the British Canadian Power Company, who is building a power plant at the Wawatian Falls, Mattagami river, is also said to contemplate an electric road covering the Porcupine district.

Regina, Sask.

It is proposed to install iron poles to carry the overhead wires of the street railway system instead of the cedar poles originally proposed.

Some 290 iron poles will be purchased for the street railway work, from Dawson & Company, Winnipeg.

Ripley, Ont.

The contract for construction of municipal system has been awarded to W. H. Lytle, Peterborough, $4,400.

Stettler, Alta.

The town council have retained the J. Galt Engineering Company as engineers on the proposed electric lighting system.

Tenders called for electric light equipment. Owner, Town of Stettler, Alta.; town commissioner, Daved Mitchell, Stettler, Alta.; engineers, The John Galt Engineering Co., 317 Portage avenue, Winnipeg, Man. One 125 K.V.A. generator, exciter and switchboard; one tandem compound steam engine; one 72-in. x 16 ft. boiler and stack; cedar poles and pole-line material; erection of pole line. Specifications, etc., at offices of the engineers. Tenders called July 3, 1911.

Saskatoon, Sask.

Tenders for the new electric power house have been let. The Dominion Bridge Company, of Montreal, were the successful tenderers for the framework.

The electric light plant by-law for $25,000 will be submitted on the 25th inst.

The city engineer reported on the street railway, presenting the following figures for a system of 5,700 lineal feet of double track, permanent construction; 14,700 lineal feet of single track, permanent construction, and for 29,280 lineal feet single track, temporary construction. The permanent construction would be of eighty pound high tee rails, pine or fir ties, on six inch concrete, the whole embedded in concrete half way up the webb of the rail, the balance taken up by paving block. The temporary construction would be of 70 pound rails on No. 1 tamarac ties with gravel ballast.

In order to encourage the use of electricity by the citizens of Saskatoon, the council have installed a complete set of heating and cooking appliances which are operated by electricity in the front part of the commissioner's office where they may be seen at any time. The

apparatus will be in charge of a young lady who will demonstrate and explain their various uses to any who call

Sarnia, Ont.

The application of the Bell Telephone Company to raise the telephone rate between Sarnia and Detroit, and Port Huron to Windsor, has not been allowed by the Railway Board.

Stratford, Ont.

A recommendation to council to submit a by-law to amend the Stratford Railway Company agreement was struck out as the company are going on with preliminary work under existing agreement.

St. Johns, N.B.

It is announced that the plan for the construction of the dam, with sluice gates, across the Richelieu at St. Johns for the purpose of regulating the level of the river above this point has been definitely decided upon. The dam is to be located just below the rapids, near this town. Mr. Paul Paradis, B.Sc., chief engineer of the government works on the Richelieu, has received instructions to have the plans completed within two months, in order that tenders may be called for and the building of the dam commenced this year.

St. Thomas, Ont.

Good progress is reported towards placing the St. Thomas Street Railway on a paying basis. The road is now operated under the superintendency of Mr. J. F. Daugharty.

Hydro-electric power has been installed in the brick-making plant of A. E. Ponsford, in this city, the first brick manufacturing concern in the province to utilize Niagara power. Forty horse power is being used.

St. Mary's, Ont.

A charter has been secured from the Dominion Parliament by the Imperial Traction Company for the construction along the Hydro-electric route, of an electric railway from Hamilton to Stratford and London with extensions to Sarnia and Niagara Falls.

Swift Current, Sask.

The contract for installation of eleven miles of rural telephone has been awarded to Chas. Wilson, this city.

In connection with power plant there will be an opening for sale of electric meters, no house connections or secondary wiring done yet. Engineer, J. Darlington Whitmore, Regina.

Toronto, Ont.

The Eastern Power Company, Limited, Toronto, has been incorporated and authorized to acquire and furnish power, etc., to construct or acquire lines of telephone and telegraph or other works. The provisional directors are: William Scott Robertson, engineer; Ernest Sidney Moyer, accountant; W. S. Morlock and Reginald H. Parmenter, solicitor, and N. B. Wormwith, student-at-law, all of Toronto.

The Ontario Railway Board was granted and application made by the Metropolitan division of the York Radial Railway, for permission to lay new switches on Yonge street in North Toronto, between the old city limits and the golf links.

The Hydro-electric Commissioners have a two-year agreement with the linemen and other electrical workers on the wage question. They will be paid for all legal and civic holidays, but must work on Saturday afternoons. The men are divided in three grades. The first grade will receive 33 1/3 cents per hour, the second grade 30 1/3 cents, and the third grade 27 1/3 cents. The commissioners and not the union is to have the sole right of determining the respective grades of the men.

Winnipeg, Man.

The date now set for the probable operation of the municipal power plant is November 1st.

The tender of Dunn Bros. for the street light known as the "mast arm," meaning that the lights are at the end of square arms on a 22-ft. standard, was accepted. Amount of tender, $15,612 for 150 delivered in the city brackets, half way up the pole to carry the signal lamps which will flash red lights for the fire department and green lights for the police patrol system will cost $7.

Woodstock, Ont.

Extensions are continually being made to the street lighting system here. City Electrician Archibald has just completed the installation on Graham street.

Whitby, Ont.

By-law carried for power company. Parties interested, Seymour Electric Power Co., and Town of Whitby. The agreement to supply power to the town wat ratified.

Welland, Ont.

Hendrick H. Leach & Co., it is stated, have been awarded the contract to build an extension of the Niagara Falls, Welland & Lake Erie Ry. through Welland. The line will connect Niagara Falls, Welland and Port Colborne, with branches to Port Dover on Lake Erie, and to Ft. Erie on the Niagara River, opposite Buffalo. C. J. McLaughlin, Toronto, Ont., is interested.

Vancouver, B.C.

To provide storage yards for cars and general equipment when the Saanich extension is built the British Columbia Electric Railway company has just purchased six and a quarter acres of land on the Burnside road, running through to Harriet street. Work is being rushed on this line.

Victoria, B.C.

The city is calling for tenders for 300 electric light standards for street lighting purposes. The new standard is of the same design as that now in use in Vancouver and New Westminster. The standard already in use here, one which a number of the members of the council approve of and prefer to that in use in the mainland cities, costs some $24 each more than the latter. It is with the object of ascertaining just what the new standard will cost that tenders are being asked.

Yorkton, Sask.

The generating plant of the town of Yorkton, Sask., was successfully placed in operation during the first week of June. The generator is operated by a crude oil engine built by Mirrlees, Bickerton & Day, of Stockport, England, The alternator itself is Siemens manufacture. The engine was supplied through the Canadian Boving Company, Toronto.

Tri-Provincial Electrical Supply Co.

ELECTRICAL & TELEPHONE SUPPLIES

405 Travellers Bldg. WINNIPEG

Railway Signal Company of Canada

The Railway Signal Company of Canada has been organized to manufacture standard railway signalling appliances such as are employed on railways in Europe and the United States. The company's works are situated at Lachine, near Montreal. A siding connects the factory with the Grand Trunk Railway. Their shops are equipped with up-to-date machinery and tools for turning out apparatus with dispatch and their shipping facilities are of the best. This company has its own automatic system for steam and electric railway as well as the power system for interlocking purposes. It has just completed a large installation of highway crossing signals throughout the system of the Intercolonial Railway. It has also secured large contracts with other railway systems including the all-electric power

signalling installation for the new Union station in Winnipeg; the first power signalling contract to be awarded in the Dominion of Canada. It is expected that the work will be completed this year.

The officials of the Railway Signalling Company of Canada are: Prof. V. I. Smart, chairman; Mr. V. K. Spicer, general manager; Mr. R. F. Morkill, assistant manager; Mr. Ramsey Gage, chief engineer; and Mr. Fred Lane, superintendent.

A New Solder in Paste Form

A new kind of solder has recently been placed on the market. It is in the form of a paste in a collapsible tube, put up like the familiar tube of tooth paste, and all that is necessary for its effective use is to scrape off the surface of the part to be soldered a little, with a knife, squeeze some of the soldering paste on and apply a match, candle or torch. When the paste becomes hot it fuses and solders in the same manner as the old style soldering stick. The name of this new device is Solderall, and is being marketed by the H. W. Johns-Manville Company, through their branch houses in various cities throughout the Dominion. While this article has been in use only a short time, it is said to have met with approval by both the trade and the public. Its convenience, cleanliness, economy and many other advantages have naturally made a wide appeal to householders as well as to plumbers, tinsmiths, electricians, hardware and supply stores.

Obituary

Mr. John E. McDougal, secretary of the Electrical Association, Montreal, and for the last year and a half in the employ of the Steel and Radiation Company of that city, was drowned in the Black River near Cartiersville. Mr. McDougal's home was formerly in Toronto where his parents now live.

Electrical News

Generation, Transmission and Application of Electricity

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ADVERTISEMENTS.

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Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

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Careless Wireman Causes Much Trouble

Unusual interest was aroused in Montreal recently over a mysterious fire that for a few days was supposed to have been of incendiary origin, but which investigation proved to have been caused by a faulty electrical installation.

Two fires broke out in different storeys of a house on Bleury street at the same time. One in the living rooms on the first floor was noticed first and the firemen who responded to the alarm found that it originated in a cupboard in which two slot type gas meters were installed. The meters, and even the money in them, had been melted. Immediately afterwards the firemen discovered a second fire in the cellar, the water pipes burst or cut and the cellar being flooded.

The Fire Commissioners held an investigation and decided that the fire was a mystery, but while unable to find out the cause, they left the tenant of the burned premises under suspicion. The insurance company interested also refused to pay over the claim.

Then J. M. Robertson, consulting engineer, and Moses Rubenstein, electrical contractor, made an examination of the premises. They found that a 110 volt line had been run into the cellar to supply a motor. In the installation for this power a condulet had been used in passing the wire over a beam and a wire splicing had been made inside the condulet. A surge on the line, or some such cause, had supposedly burned a hole in the cover of the condulet, starting the fire in the cellar, and as the installation was grounded to the gas pipe the current traversed the gas main up to the two meters in the cupboard. Being of the old type, with the parts soldered on the inside, these instantly melted, allowing the gas to escape and ignite, and setting fire to the cupboard and other woodwork. At the same time, a poor contact having been made to the water main in the cellar, the current jumped to the lead pipe and melted it, flooding the place with water.

When these findings were brought to the attention of the Fire Commissioners the cause of the fire was changed to "accidental," and on the recommendation of the Fire Underwriters' Association the insurance money was paid over.

An installation made in this way, with a splice within the condulet, is, of course, contrary to the rules of the Underwriters' Association, but is a piece of illegality practically impossible to detect by inspection, and the occurrence only emphasizes the fact that after all it is not rules that save us, but the observance of them. In the last analysis we are at the mercy of the men who actually perform the work, and doubtless much similar trouble has been caused and incidentally the reputation of many an electrical contractor or engineer injuriously affected by just such careless work. The only remedy seems to be eternal vigilance on the part of the inspector, coupled with an earnest endeavor to instil in the minds of the workmen the serious nature of the work they are doing.

While it is probably true that electricity is blamed for many fires for which it is in no way responsible, we believe that too great publicity cannot be given a proven case like the present and that care should be taken by all electrical contractors to bring such a matter prominently before the attention of their employees.

Electric Smelting of Interest to Canada

A short but interesting descriptive article appears in this issue on the recent progress of electric iron smelting in Sweden and Norway. This process becomes each year of greater interest to Canada on account of the quite similar conditions existing here and in Norway and Sweden—namely, a limited and expensive supply of reducing fuel for blast furnace work which is counterbalanced by a fortunate combination of water power and iron ore deposits in close proximity. In Canada this combination is known to exist to a quite favorable degree in Quebec in the district lying north of the Ottawa River.

The Canadian Government has been an interested spectator of the experimental work being carried on in Europe and reports have been made from time to time by Dr. Haanel of the Canadian Department of Mines. Some experiments were even performed at the Soo some years ago looking to the establishment of a plant there, but though the experiments were successful it was not believed a plant could be established on a profitable basis and the matter was dropped temporarily pending further development in the art.

In Sweden, however, the problem has been handled with more vigor and, following some quite successful experiments by a number of engineers operating on their own account, the matter was taken up by the Swedish Association of Ironmasters who have spent largs sums of money in making further tests looking rather to the commercial efficiency of the furnace. These results appear to have satisfied the association that under favorable conditions of power supply the results of the electric furnace both as to quality and cost of operation fully justify the continuance and extension of the plant.

Believing the conditions would justify the establishment of similar plants in Canada the Canadian Boving Company who are agents in Canada and the United States

for these furnaces, have sent an electric furnace specialist to Canada in the person of Mr. Thomas D. Robertson who will investigate conditions here and endeavor to interest the government, the various iron producers and others in the possibilities of the electric furnace as applied to local requirements. We are sure Mr. Robertson will receive from every quarter the consideration the importance of his mission demands and we are hopeful that much ultimate advantage will accrue to the Canadian iron trade as a result of having this matter brought so prominently to the attention of those interested.

Interference from Amateur Wireless Installations

It is said there are in Montreal and vicinity fourteen amateur wireless telegraph installations, more than half of which are in Westmount. The strongest of these is reported to have a fifty mile radius of sending and receiving power. It is believed that some of them are able to read Marconi messages received at and dispatched from the Tarte pier on the harbor front. The Marconi people say that they have heard messages or characters, of very weak impression, however, from some of these instruments. So far, however, they have had no cause for complaint on account of any interference with their operations, the amateur instruments being too weak to interrupt their intonations.

That there should be put in force a law that would require the registration of amateur wireless plants having a radius that would be capable of interfering in any way with installations established for commercial purposes is the opinion of many telegraph men. In fact, we believe, there is already a statute in part covering this point which up to the present there has been little or no need to apply. If, however, amateurs can install and operate plants with capacity such as to interfere with commercial messages, some protective arrangements will soon have to be made.

Our Convention Cover Appreciated

The Electrical News management might well be pardoned a feeling of satisfaction at the reception accorded their special cover design for the Convention number. It is true enough that "clothes do not make the man," but we all admit the unconscious influence of the well groomed man—or woman—and in placing the order for a convention suit for the Electrical News with the well-known English artist, Mr. W. Heath Robinson, we were only recognizing this basic fact. We have received many spoken expressions of appreciation from our readers, and also numerous letters, of which the following are typical:

From Mr. Philip S. Dodd, Director of the National Electric Lamp Association.—"Allow us to compliment you on the cover of this issue, which strikes us as being one of the most humorous cover designs we have ever seen on any paper."

From the Lindsley Bros. Company, Spokane, Washington.—"We want to compliment you on the very amusing cover design on your July issue. It has caused much merriment among our friends."

From Mr. Parker H. Kemble, general sales manager, Toronto Electric Light Company, "I purchased an extra copy, removed the cover, and am having it framed for my office, as it is the most delicious bit of electrical humor I have seen for a long time."

New Rates for Meter Testing

Beginning with July 1, 1911, a recent Order in Council establishes the following tariff of fees for the verificatio of electric meters. It will be noted with satisfaction that arrangements are included for the examination of meters without removal from the customer's line—a valuable concession on the part of the government, as undoubtedly frequent errors creep in during transportation or placing of meters. In both the reduced rates and the added concession the executive of the Canadian Electrical Associati n at last reaps the reward of years of persistent effort towards that end, for it is undoubtedly entirely due to their active influence that the changes have been brought about.

Meters will be verified at regular testing places as follows:—

Class 1.—Ampere-hour meters of any type or capacity, for use on circuits of any voltage, and two wire watt-hour meters of any capacity, for use on circuits not exceeding 250 volts $0.60

Class 2.—Three wire direct current or three wire single phase watt-hour meters of any capacity, for use on circuits not exceeding 250 volts between outers, and polyphase meters of any capacity for circuits with a maximum potential not exceeding 250 volts $0.75

Class 3.—Meters similar to Classes 1 and 2, but for potentials exceeding 250 volts, but not exceeding 650 volts $1.50

Class 4.—Meters similar to Classes 1, 2 and 3, but for potentials exceeding 650 volts $5 00

Meters verified in situ—Disputed meters may, at the request of either the purchaser or the contractor, be tested in situ, in which case an additional fee is to be charged of $1.00

New T. E. L. Company Rates

Residence Rate.

For 4, 5 and 6 roomed houses, the first ten kilowatt hours or less, used in any one month will be billed at eight cents per kw. h.; all over at three cents per kw. h. For 7 and 8 roomed houses, the first fifteen kilowatt hours, or less, used in any one month will be billed at eight cents per kw. h.; all over, at three cents per kw. h. For 9 and 10 roomed houses, the first twenty kilowatt hours, or less, used in any one month will be billed at eight cents per kw. h.; all over, at three cents per kw. h. For 11 and 12 roomed houses, the first twenty-five kilowatt hours, or less, used in any one month, will be billed at eight cents per kw. h.; all over, at three cents per kw. h. For larger houses, the charge will be in accordance with the installation. All bills are subject to 10 per cent. discount for payment within ten days from date of bill.

Commercial Lighting Rate

For the first thirty hours use of the maximum demand eight cents per kw. h.; for all current used afterwards, three cents per kw. h. Ten per cent. discount on one year contracts for payment within ten days from date of bill. No free lamp renewals. In d.c. districts d.c. to be supplied. In a.c. districts a.c. to be supplied. Minimum bill, one dollar per month per kilowatt of demand. One kilowatt lowest taken.

Commercial Power Rate A. C.

For twenty kilowatts and under.—For the first fifty hours use of the maximum demand per month, five cents per kw. h. For the second fifty hours use of the maximum demand per month one cent per kw. h. For all current used over this amount one-half cent per kw. h. Term, one year. Discount, ten per cent. for prompt payment. Minimum

bill, one dollar per horse power of maximum demand per month. One horse power lowest taken.

For over twenty kilowatts,—For the first fifty hours use of the maximum demand per month, four and one-half cents per kw. h.; for the second fifty hours use of the maximum demand one cent per kw. h. For all current used over this amount one-half cent per kw. h. Terms, one year. Discount, ten per cent. for prompt payment. Minimum bill, one dollar per month per horse power of maximum demand.

Lighting Rates in Truro

Some time ago a complaint was lodged against the Chambers Electric Light & Power Company of Truro, Nova Scotia, for alleged excessive charges for electric power and light. The matter was investigated by the Board of Commissioners of Public Utilities and as a result the following rates have now been fixed:—

A regular charge of sixteen cents per kilowatt hour, the minimum charge per month per meter for current to be $1.14. Where motors are used the minimum charge for current shall be $3.00 per month. The following discounts are allowed on all monthly bills paid within five days after rendered—on all accounts up to $2.00 a discount of 12½ per cent.; on all accounts over $2.00 and up to $5.00 a discount of 25 per cent.; on all accounts over $5.00 and up to $20.00 a discount of 33 1-3 per cent. The company shall furnish at its own expense all meters necessary. Electric current shall be furnished continuously within the town of Truro.

Special rates were given as follows:—the town of Truro, light for streets $380.42 per month and 10 cents per kilowatt hour per meter consumption in all of the town's buildings. Hopper Bros., 20 h.p. motor used irregularly but never during lighting hours, $55 per month. Truro Carriage Company, not to use power during lighting hours and in consideration of this get all current over $40 per month at half price.

Successful Year for Canadian Tungsten

The annual meeting of the Canadian Tungsten Lamp Company, Limited, was held in the Board Room at the head office of the company, in Hamilton, on Wednesday, July 5th. All the shareholders, with two exceptions, were present. Mr. Ginder, the president and general manager, presented his annual statement, showing a business increase of nearly 40 per cent. over the previous year, and, notwithstanding the amount of money spent in research work in their laboratory, the balance to the credit of the profit and loss account was deemed most satisfactory. The usual dividend was declared. All the directors retired but were unanimously re-elected, viz.: W. H. Ginder, president and general manager; F. W. Gates, vice-president; P. D. Crerar, K.C., honorary treasurer; Geo. Webb, A. Ward and G. H. Levy, Board of Directors.

Owing to the increase in business, at the suggestion of Mr. Ginder, an executive committee of three was elected, before whom all vital questions will be brought and decided upon, this committee reporting full particulars to the board of directors at their monthly meetings. The company own a large piece of ground in the rear of their factory and the question of building a five-storey extension was fully discussed. The president was instructed to get plans and specifications so that arrangements could be made to commence immediately this most necessary addition.

Electric Railway Merger

On July 13th a meeting of the directors of the Sherbrooke Railway and Power Company was held in their offices in the Commercial Union Building, St. James street, Montreal, when the purchase by that company of the Eastern Townships Electric & Power Company and of The Stanstead Electric Light Company, was approved and concluded. The negotiations thus terminated give the Sherbrooke Company fourteen miles of trackage. The service of the Eastern Townships Company accommodates the residents in and between the following towns and villages: North Hatley, Waterville, Lennoxville, Compton, Capelton, and Eustis. The Stanstead line connects Rock Island, Beebe Plains, Derby Line, Beebe, Derby Centre, Vt., and Stanstead Junction. The names of these two companies will disappear as soon as the formalities in connection with the legal absorption are concluded and the entire service will be known as the Sherbrooke Railway and Power System. The officials of the company are: Mr. C. J. McCuaig, president; Messrs. S. H. Ewing, Frank Thompson, R. T. Hopper, W. H. Brouse, and William Farwell, directors. The company's power plant is at Sherbrooke, Que. The Sherbrooke manager is Mr. N. C. Pilcher, and the superintendent of motive power Mr. J. B. Woodyatt.

Monorail in Sydney

The Sydney, East Bay & Waterford Railway Company have secured a subsidy of $30,000 from the local government of Nova Scotia and a further subsidy of $1,000 a mile from the municipality of Cape Breton, to construct a mono-railway line from East Bay to Sydney, a distance of 15 miles. The survey has been completed and the work will begin immediately. Gasoline engines will be utilized for power production in the initial operations, but a short distance from East Bay and near the line there is a water power which is estimated to be capable of giving 1,000 h.p. and which the company intend to develop.

The road will tap large deposits of gypsum and limestone and the intention is to carry the gypsum to tide water and limestone to Sydney for use in the Steel Company's works.

The intention is to install equipment for both passenger and freight traffic and it is hoped the road will be completed during the present season.

The following are included among the officers and directors of the Mono-rail company: F. G. Konig, president; Dr. Kendall, M.P.P., vice-president; G. McCuaig, treasurer; P. C. Campbell, secretary; I. B. McCormic; I. P. Joy; T. D. McNeill; D. A. Cameron.

Edmonton Extensions to Power Plant

The city of Edmonton has recently placed an order for a 2,000 kw. high pressure double-flow steam turbine and generator, the first of its kind in Edmonton, with the Canadian Westinghouse Co. for installation on or before Dec. 1st, 1911. The city also has under consideration the building of primary feed line from power house to sub-station to supply a 500 kw. motor generator purchased from the Canadian Westinghouse Company in February, same to be in operation not later than Aug. 1st, 1911; the distance from power house to sub-station is 1½ miles, the sub-station being located close to the car barns. The motor is 2,300 volt, self starting. The city have also under consideration at the present time the installation of 75 magnetite arc lamps, which will be erected through the business section of the city. They are also considering the installation of ornamental standards on three or four of the principal streets. Mr. J. C. Huffman is engineer-in-charge.

New Line to Murray Bay

The Quebec and Saguenay Railway Company, incorporated under provincial charter, is building from the end of the Quebec Railway, Light, Heat & Power Company's line, at Cap Tourmente to Murray Bay, a distance of 56 miles. The road will be a single track, and operated by steam at present, by the Quebec Railway, Light, Heat & Power Company, which owns all the stock of the Quebec & Saguenay Railway Company. The contract for the entire work has been let to Mr. M. J. O'Brien, railway contractor, Renfrew, who at the present time, through sub-contractors, has about 2,500 men at work.

A Canadian Member of Committee

A reorganization of departments has recently taken place in connection with the National Fire Protection Association with headquarters in Boston. Formerly the business was administered by a national committee of 350 members. Under the new system a special committee will look after fire proofing; another, electrical work, and so on. Mr. James Bennett, chief electrical inspector for the Canadian Fire Underwriters' Association, Montreal, has been elected a member of the electrical committee. He is the only Canadian on this very important executive board, charged with the maintenance and revision of the national electrical code. His choice for this position will receive the hearty approval of his associates in Quebec province and not less in other parts of the Dominion where his ability as an electrical expert is acknowledged.

Norwich Buying Out Private Plant

The Corporation of Norwich has completed arrangements with Mr. Webster to take over his electric light plant or such part of it as will be useful in the distribution of Niagara power when it arrives. The basis of the agreement is that 100 per cent. of its value shall be paid for such material, etc., as can be used in the distribution system and 75 per cent. of the estimated cost of the installation of this material. Such part of Mr. Webster's equipment as is of no use to the municipality he is at liberty to sell as scrap iron. This latter part represents, it is understood, approximately 50 per cent. of the value of the plant.

Electric Display at the Canadian National Exhibition

It is claimed by the management of the Canadian National Exhibition that this year's electrical display will be much the finest in the history of the association. The following paragraph appears in their recently issued bulletin:

"Are you interested in electricity? If you are, you will find at the Canadian National Exhibition every device of which the great white power has been made the servant of man. The Hydro-electric will have a special display and independent concerns are clamoring for space to show the public the value of their inventions. It is the electric age."

Gas Producer Plant for Charlottetown

The Charlottetown Electric Light & Power Company have recently purchased from the Canada Foundry Company, Toronto, a Canada Suction Gas Producer of 175 h.p. capacity. This will operate a twin cylinder Premier gas engine of 172 h.p. capacity belted to an alternating current generator. The gas engine will be arranged to start with compressed air. This is worthy of note as the installation of a gas producing plant in the region of cheap coal is a venture which will be watched with much interest.

Middleton Will Have Municipal Plant

At a meeting of the ratepayers of the town of Middleton, called for the purpose of discussing the question of borrowing $15,000 for the purchase and installation of an electric light plant to light both the streets and houses, it was decided to vote the money and proceed with the plant. The town of Middleton is one of the best in the Annapolis Valley and is the junction point of the D. A. R. Co., and the Halifax & South-Western Railway Company. It is hoped that the installation will be completed this summer.

Correspondence

Editor Electrical News,—

Dear Sir,—We note advertisement on the back of your July issue of the Colonial Engineering Company to the effect that in spite of the big "splurge" made by Hydro in London only a few horse power have been connected. As the advertisement is so grossly misleading I would ask you to kindly publish the following:—

Total connected load, July 1st, 1911, 3,279 horse power.

Load contracted for and to be connected in the immediate future, 1,081 horse power.

Total load contracted for to July 1st, 4,360 horse power.

This is the result of five months' campaigning. Contracts for all of the above can be inspected at any time at this office.

Moreover, I wish to advise that the Empire Manufacturing Company, whom the advertisement quotes as using their gas producer and engines, have signed for power up to 25 h.p. to drive machinery in the extension which they are at present building.

Also, the McClary Manufacturing Company, who have a gas producer installation at their Adelaide street plant, have installed to date 235 h.p., and will by the end of this year use 500 h.p., so that a special little sub-station is being built just for them. Mr. King, of the McClary Manufacturing Company, informs me that while the guarantees of the Gas Producer Company were maintained in the first month, ever since then their costs have been about doubled. Also, the entire independence from engineering and labor troubles such as are always imminent with a gas producer and steam plant are entirely overcome by the introduction of our motors, thus leaving the management time to devote all its energies towards the raising of efficiency in the essential factory departments, spelling increased profits for the plant.

I might add that Gas Producer people in quoting prices per horse power and comparing it with electric energy generally do not take account of the large floor space taken by the gas producer and gas engine equipment, nor of the building, necessary to cover this space; charging taxes, interest, depreciation and maintenance on these items will considerably change the theoretical costs of power which are quoted by the Gas Producer Company. As you are probably aware, the Hydro-electric Power Commission prepared extensive reports after going into the matter of gas producer very thoroughly and you may rest assured that if it were possible to generate cheaper power by gas producers, the government would not have gone to the expenditure of millions of dollars for the transmission of power from Niagara Falls.

Yours very truly,

H. J. Glaubitz,

General Supt. Waterworks & Electrical Depts.

City of London

Makers of Electrical Canada—8

Robert A. Ross, Consulting Engineer

One of the most outstanding personalities in the making of electrical Canada during the last twenty odd years is Robert A. Ross, late partner in the firm of Ross & Holgate, consulting and supervising engineers, Montreal, and now operating independently under the firm name of Robert A. Ross, Limited. To readers of the Electrical News, who know Mr. Ross only by reputation, it will come rather as a surprise to learn that he is only 45 years old, and, though he has already accomplished so much, still has the best working years of life ahead of him. At the present time there is no name among Canadian consulting engineers held in greater respect and no personality more likely

Mr. Robert A. Ross, E. E.

to continue to make itself of ever-increasing value in the electrical advances of the immediate future in Canada.

Born in Woodstock, Ontario, Mr. Ross attended the Collegiate Institute in that town and matriculated in 1882. He did not proceed at once to the University, but, instead, served a vigorous apprenticeship, during the next four and a half years, with the firm of Robert Whitelaw & Company, engine boiler makers and millwrights, in the town of Woodstock. Following this apprenticeship term he entered the School of Practical Science of the University of Toronto and graduated in the department of mechanical engineering in 1890. Six years later, in 1896, he also gained the professional degree of electrical engineer.

Following graduation Mr. Ross was with the Edison Company, Schenectady and Sherbrooke, and later with the Canadian General Electric Company, at Peterborough, as works engineer, up to 1893. From 1893 to 1895 he was chief engineer of the Royal Electric Company, Montreal, in charge of their factory and lighting system.

Mr. Ross began private consulting work on his own account in 1896, and during the next five years acted as consulting engineer to various large corporations, such as the Canadian Pacific Railway Company. During the same period he visited and reported on properties for an English syndicate in China, Burmah, India and Scotland, as also for a Canadian and United States syndicate on properties in Russia and Finland. In 1901 the firm of Ross & Holgate was formed, and has been continued up to the present time. During the years of the partnership with Mr. Holgate, Mr. Ross has acted in the capacity of consulting engineer to a number of large corporations, including the Canadian Pacific Railway Company, the Ontario Power Commission, and numerous hydro-electric power companies. He has also reported on various schemes in distant countries, including the West Indies and Australia, China and Russia. In addition he has built a large number of steam and electrical plants in various parts of Canada and is continually reporting on large schemes in which private capitalists, financial houses, etc., are interested and acting in a consulting capacity in various matters to different cities in Canada and to the governments of some of the provinces.

Through all his professional activity Mr. Ross has maintained his interest in university matters and during the years 1908-09-10 was honorary lecturer in McGill University, in engineering economics, dealing with what is usually left out of a university course—the business features of an engineer's education. He is also examiner for the professional degree at the University of Toronto; is a member of the Canadian Society of Civil Engineers, and a member of the American Institute of Electrical Engineers.

Montreal Notes

Officials of the Shawinigan Water & Power Company expect to have their new transmission lines between Shawinigan and Montreal in place and to be delivering power in this city over their own right-of-way by the first of October. This line, in emergency, could deliver up to 100,000 h.p.

Mr. Takahashi, C.E., arrived in Montreal recently for the purpose of inspecting the principal electrical installations in this vicinity with a view to adopting the best principles in some work he is undertaking in connection with power development and transmission about 150 miles from Tokio. Mr. Takahashi said that Tokio is now supplied with power from two hydraulic plants of 67,000 h.p. and four steam plants aggregating 140,000 additional horse power.

The City of Westmount has appointed a committee to study the question of installing an electric flashlight system for the purpose of improving their police protection service. By this system the central station could keep in touch with every policeman on the beat. It is said that the adoption of this system will enable the police department to do away with the reserve at headquarters, as men on the beat could be called in immediately in case of emergency.

Among the tenders for pumping machinery, cranes and blowers for the new filtration plant for the City of Montreal was that of the British Electric Plant Company, Limited, of Alloway, Scotland, represented here by Messrs. Drummond, McCall & Company, whose tender of $40,250 was the lowest. Other tenderers were: The Canada Foundry Company, of Toronto, $46,700; W. H. Allan, Belford, England, $47,200; John Inglis Company, Toronto, $49,500; and D. Adamson, Manchester, England, $49,500. It is understood that the City Engineer will recommend that the lowest tender be accepted.

Power Developments in Kootenay District

Description of Plants of West Kootenay Power and Light Company—Rapid Industrial Development during Last Decade

By L. A. Campbell

The total length of the Kootenay River is about 350 miles, the drainage 9,800 square miles. The minimum flow at Bonnington Falls, which is situated ten miles below the city of Nelson, is 5,850 cubic feet per second. The maximum flow is about 60,000 cubic feet per second. The low water period is in the months of January and February, high water period in the months of June and July. The flow of water depends almost entirely on the melting snows from mountains of high altitude.

No. 1 Plant

This plant is situated on Lower Bonnington Falls, and has a capacity of 4,000 horse power. Work was commenced on the construction in the year 1897, and was completed and power was being transmitted to Rossland and Trail in 1898, a distance of 32 miles. The normal working head is 34 feet. The installation consists of three units, two with a capacity of 1,000 h.p. each, and one of 2,000 h.p. The water wheels are "Victor" type, horizontal setting cylinder gates, one right hand and one left hand runner on each unit; the smaller units having 39 inch runners and the larger 45 inch. The generators are direct-connected to the water wheels and are 3-phase, 1,100 volts, 60 cycle, 180 r.p.m. The generator voltage is stepped up to a line voltage of 22,000 volts through air blast transformers, of which there are four banks, three transformers in each bank, with a capacity of 1,000 h.p. per bank. All the electrical equipment in this plant was furnished by the Canadian General Electric Company.

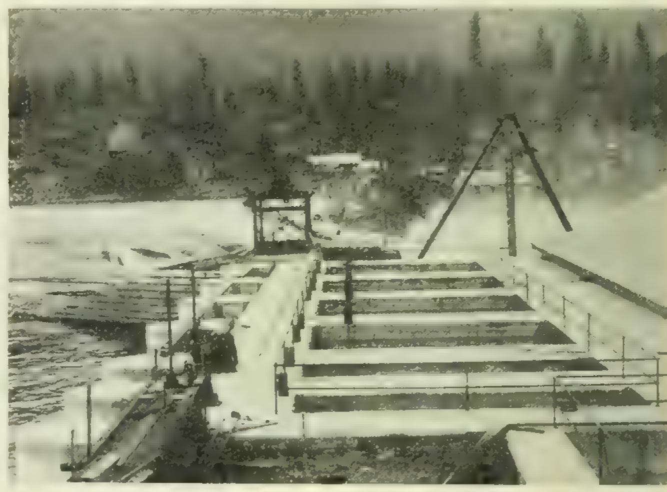
No. 2 Plant

This plant is situated at Upper Bonnington Falls, distant about one mile from No. 1 plant. Construction work

Power House No. 2—Discharge Side

was commenced in July, 1905, and completed in January, 1907. The power house is built in the channel on the north side of the river. About 70,000 cubic yards of solid granite rock had to be excavated for forebay, power house site and tail race.

The natural head of water is about 63 feet at low water [illegible], during high water this head is reduced to 56 feet on account of a difference of seven feet between the rise of water above and below the falls. This difference of water level is caused by the contracted area of the channel, a short distance below the falls. To overcome this loss of head during high water the power company have decided, when load demands it, to remove the obstruction in the channel below the falls, thus increasing the sectional area to such an extent that the water level at high water below the falls will be lowered about five feet. They also will build a dam across the river above the falls, which



Head Works—Power House No. 2

will raise the head at high water and by this means equalize the head between the extremes of high and low water, and at the same time increase the working head to 70 feet.

The power house is of monolithic concrete construction, reinforced, where necessary, by round steel rods and steel rails. The water enters the flume through submerged openings between the piers, and can be shut off by gates and stop logs, operated by an electrically driven overhead travelling winch. The trash racks are placed behind the gates and are accessible for repairs. The water flows through intakes, formed in the concrete to the wheels, of which there are three on each shaft, two discharging into th upper draft tube and one into the lower tube. The draft tubes are moulded in the concrete and joined together at the lower end, forming one common discharge. No steel lining is used.

The pressure pumps, governors, and low tension cables are located in the chamber beneath the main floor, the only machinery on the main floor being generators and switchboards. A 30-ton electrically operated overhead travelling crane spans the building, and railroad cars can be brought into the power house under the crane. The tail race openings are provided with gates and stop logs for each unit, and by closing same and pumping out wheels and draft tubes these are accessible for examination at any stage of the water. A motor driven centrifugal pump is installed with the suction pipe connected to each draft tube chamber.

Hydraulic machinery.—Each main unit has a capacity of 8,000 mechanical horse power, when operating under a head of 70 feet and at a speed of 180 r.p.m., and requires 1,260 cubic feet of water per second at full load. There are three inward flow Francis type runners bolted to a hub

on the shaft. The upper and intermediate runners discharge in opposite directions into one common draft tube, the upper one discharging downwards. The lower runner also discharges downwards, but into a separate draft tube. The chamber of the top runner is connected by a pipe to the draft tube so that the thrust is practically balanced. The

Generators—Power House No. 2

thrust bearing is made up of two discs, the lower one supported by a ball seat and the upper one held in place by an adjustable nut on the shaft. Oil is forced under a pressure of 150 lbs. per square inch between the discs. Each unit is governed by a Glocker-White mechanical governor and is under the control of the switchboard operator on the main floor.

Generators.—Provision has been made for four generators, two of which are installed. Each generator is of the umbrella type directly connected to vertical water wheel shaft, 4,500 kw. capacity, 2,200 volts, 60 cycle, 180 r.p.m., working at 80 per cent. power factor. They are designed to stand a continuous overload of 25 per cent. There are two exciters installed, each capable of exciting the entire equipment, when complete. They are also of the umbrella type, directly connected to vertical water wheel shafts.

Switchboard.—All the main high and low tension oil switches are electrically controlled by the operator at the bench board. The bench board is situated in front of the instrument panels, all connections thereto being reduced to a potential of 110 volts.

Transformer House.—The transformer and switch house is built at right angles to the power house and parallel with the railroad siding. It is arranged for four banks of 60,000 volt transformers, two of which are installed. The transformers are water cooled, and oil insulated, three transformers delta connected to each bank, each transformer having a capacity of 1,875 kilowatts, stepping the voltages up from 2,200 to 60,000 volts. There is also installed one bank of three transformers, each of a capacity of 1,250 kilowatts, stepping up the voltage from 2,200 to 22,000 volts. The latter bank may be paralleled with the No. 1 plant, and is used for supplying power to Rossland, Trail and Nelson.

Summed up, the electrical equipment in this plant consists of the following: two A. T. B. 40, 4,500, 5,625 kv.a., 180, 2,200 volt generators; two M.P. 6, 150, 400, 125, direct-connected exciters; switchboard apparatus for four 4,500 kw. A.T.B. generators; storage battery sets; all 2,200, 22,000 and 60,000 volts, motor operated oil break switches; two sets 60,000 volt aluminum cone lightning arresters; two sets 22,000 volt multiplex lightning arresters. The above all furnished by the Canadian General Electric Company. The Westinghouse apparatus comprises two banks (installed), three transformers each bank, each transformer having a capacity of 1,875 kw., or 1,500 kw. at 80 per cent. power factor, 2,200/60,000 volts; one bank interconnecting transformers, three transformers in the bank, each transformer having a capacity of 1,250 kw., or 1,000 kw. at 80 per cent. power factor, 2,200/22,000 volts; two regulating transformers, each having a capacity of 440 kw., 2,200/440 volts; one polyphase regulator used in connection with regulating interconnecting transformers.

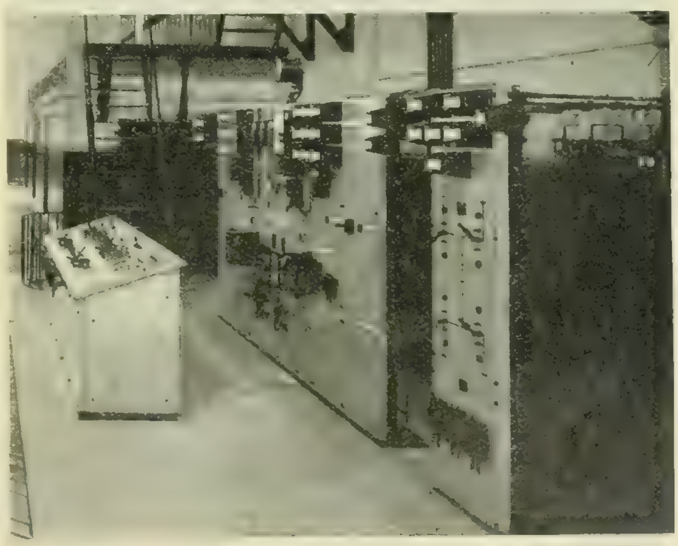
When complete the equipment in No. 2 plant will consist of four 4,500 a.c. generators; two 150 kw. exciters; four banks of 60,000 volt transformers; one bank of 22,000 volt transformers.

All bus bar copper was furnished by the Hill Electric Company, of Montreal. All waterwheel equipments were furnished by the I. P. Morris Company, of Philadelphia, consisting of two 8,000 h.p. turbine wheels with oil pumps, piping, etc., complete; gravity oiling system complete; two 500 h.p. turbine wheels for exciter installations.

Sub-Stations

The sub-stations are designed on the same lines and equipment as the transformer house at the power house.

Trail sub-station—owned by the Consolidated Mining & Smelting Company of Canada, Limited. Connected to No. 1 and No. 2 plants. The equipment consists of one bank (three transformers) 1,250 kw. each; 16,500/600 volts, oil insulated, water cooled, Westinghouse manufacture; two banks (six transformers) 150 kw. each, 16,500/600 volts, oil insulated, manufactured by the Wagner Electric Company. All switchboard apparatus, including lightning arresters, manufactured by the Canadian General Electric Company.



Bench and Panel Boards—Power House No. 2

Rossland sub-station.—Connected to No. 1 and No. 2 plants. Equipment consists of one bank (three transformers) 1,250 kw. each, 60,000/22,000 volts, oil insulated, water cooled, Westinghouse manufacture; two banks (six transformers), 750 kw. each, air blast, 16,600/2,200 volts, and all switchboard apparatus, Canadian General Electric manufacture.

Grand Forks sub-station—Connected to No. 2 plant. This equipment consists of two banks (four transformers), 1,250 kw. each, 60,000/440 volts, oil insulated, water cooled, manufactured by Canadian Westinghouse. All switchboard apparatus, motor operated oil break switches, storage battery set, lightning arresters, etc, manufactured by Canadian

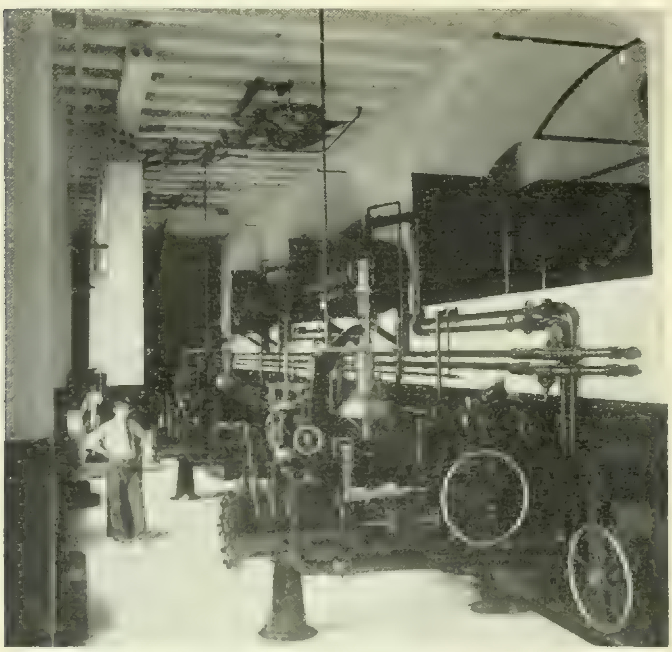
General Electric. When this installation is complete there will be two banks (six transformers), 1,250 kw. each, 60,000/440 volts, oil insulated, water cooled.

Phoenix sub-station. Connected to No. 2 plant. This equipment consists of one bank (three transformers), 1,250 kw. each, 60,000/2,200 volts, oil insulated, water cooled, Westinghouse. All switchboard apparatus, motor operated, oil-break switches, storage battery set, lightning arresters, etc., are Canadian General Electric. When this installation is complete there will be two banks (six transformers), 1,250 kw. each, 60,000/2,200 volts, oil insulated, water cooled.

Greenwood sub-station.—Connected to No. 2 plant. This equipment consists of one bank (three transformers), 1,250 kw. each, 60,000/2,200 volts, oil insulated, water cooled, Westinghouse manufacture. All switchboard apparatus, motor operated oil-break switches, storage battery set, lightning arresters, etc., manufactured by Canadian General Electric. When this installation is complete there will be two banks (six transformers), 1,250 kw. each, 60,000/2,200 volts, oil insulated, water cooled.

No. 3 Plant

No. 3 plant is situated on the Kettle River in the Boundary District about twelve miles below the town of Grand Forks and commenced delivering power in 1902. The head is 156 feet. About half a mile above the power house the river enters a gorge which is a series of rapids and falls, the natural fall of which is 120 feet. This natural head has been increased by building a dam at the head of the gorge and raising the water by that means about 36 feet. From the dam the water is conveyed by open rock cut 700 feet



Pump Chamber—Power House No. 2

and tunnel 400 feet to the head gates. From the head gates the water is conveyed by means of a 7-foot pipe to the water wheels in the power house at the foot of the gorge.

Hydraulic machinery.—The installation consists of three units having a capacity of 1,300 horse power each, horizontal setting, two 39-inch runners on each setting. Speed is controlled by Escher-Wyss mechanical governors. There are two exciter wheels of 60 h.p. capacity, 1,100 revolutions per minute.

Electrical machinery.—The three generators are direct connected to water wheel shaft, 750 kilowatt capacity each, 3-phase, 2,200 volts, 60 cycles, 400 r.p.m. Two exciters 45 kw. capacity, directly connected to water wheel shaft are installed.

Transformers.—There are three banks of transformers, self cooling, oil insulated, with three transformrs to each bank, each transformer having a capacity of 312 kilowatts. Through these transformers the voltage is stepped up from 2,200 to 22,000 volts, to duplicate transmission lines to Grand Forks, 12 miles; Phoenix, 21 miles; Greenwood, 25 miles, and Boundary Falls, 28 miles. Sub-stations are installed at each of these points, distributing power at 2,000 volts.

Summed up the electrical equipment in this plant consists of the following:—three 750 kw. 3-phase, 2,200 volts, 60 cycles, 400 r.p.m. generators; two 45 kw. 125 volt exciters, together with all transformers and switchboard apparatus. All Westinghouse materials.

Grand Forks sub-station.—Connected to No. 3 plant. This equipment consists of one bank (three transformers), 242 kw. 20,000 to 500 volts, air blast, together with its switchboard apparatus, all Canadian General Electric; one bank (three transformers), 312½ kw., oil insulated, natural cooled, 20,000 to 500 volts, together with its switchboard apparatus, Westinghouse manufacture.

Phoenix sub-station.—Connected to No. 3 plant. Equipment consists of one bank (three transformers), 312½ kw. each, 20,000 to 2,000 volts, oil insulated, natural cooled, all switchboard apparatus and transformers Westinghouse manufacture.

Boundary Falls sub-station.—Connected to No. 3 plant. Equipment consists of one bank (three transformers), 312½ kw. each, 20,000 to 2,000 volts, oil insulated, natural cooled, together with all switchboard apparatus and transformers; all Westinghouse manufacture.

Industrial Development in Kootenay District

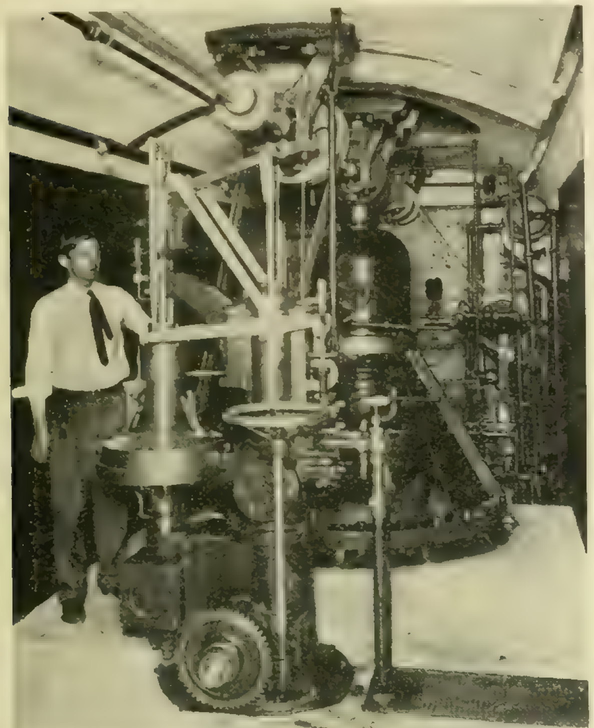
When work was started on No. 1 plant the country, as far as the gold and copper mining was concerned, was practically undeveloped, and it was more or less of a gamble as to whether or not sufficient power load could be obtained to make a success of the enterprise. At that time the Trail smelter was a very small concern, and the total power required for the operating of these works did not exceed 400 h.p. The total power used at the mines at Rossland did not exceed 600 h.p., making a total available load of 1,000 h.p. at the end of a 32-mile transmission line.

To-day the Consolidated Mining & Smelting Company of Canada, who are operating the Trail smelter, have motors installed having a capacity of 1,800 h.p. They also operate an electrolytic lead refinery. This process was brought to perfection by this company under the supervision of Mr. Betts, who holds the patent rights for this process. The power required for the operating of this refinery amounts to 1,100 h.p. This will give the reader a rough idea of how this company has increased its smelting capacity since 1898.

As said above, the mines in Rossland in the year 1897 were using approximately 600 h.p. To-day they use as follows:—Total h.p. in motors installed at War Eagle and Centre Star mines, 1,700 h.p.; lighting of Rossland, 440 h.p.; Rossland Great Western Mining Company, 800 h.p.; Le Roi Mining Company, 600 h.p. capacity of motors installed, and in addition to this have compressors and hoists with a capacity of approximately 3,000 h.p. White Bear Mining Company have motors installed having a capacity of 800 h.p. The Giant California Mining Company have motors installed having a capacity of 150 h.p.; the Le Roi No. 2 have motors installed having a capacity of 250 h.p.; the Jumbo Gold Mining Company have motors installed having a capacity of 100 h.p. Other small motor loads installed in Rossland 250 h.p. This makes a total capacity of motors installed at the present of 5,000 h.p., as against 400 h.p. of

steam apparatus which was in actual operation in 1897. This to give the reader some idea of the progress of the Rossland mining camp.

In the year 1897 the power used in what is known as the Boundary Country was practically nothing. To-day,



Thrust Bearing and Governor of Exciter Unit

starting at Grand Forks, the Granby Consolidated Mining, Smelting & Power Company have installed, for the operating of their smelter, motors having a capacity of 1,750 h.p. This is used for the smelting of all the ores produced by the Granby Company's mines in Phoenix. In addition to this the power required for lighting, and operating small motors in the city of Grand Forks, amounts to approximately 400 h.p. In view of the fact that there was no power used whatever in the year 1897, this will give the reader some idea of the advancement made since this date.

At Phoenix Camp, where in 1897 there was nothing but a heavily timbered mountain, there is to-day being used between the Granby Consolidated Mining, Smelting & Power Company, Limited, the Dominion Copper Company, Limited, and the Consolidated Mining & Smelting Company of Canada, motors having a capacity of 4,350 h.p.

In Greenwood, where the British Columbia Copper Company's smelter is situated, and where in the year 1897 practically no power whatever was used, they have to-day motors installed having a capacity of 3,800 h.p. These motors are used for the operating of the smelter, and for their mines situate in Deadwood Camp, and Summit Camp.

In order to take care of this business, which gradually grew far in advance of what the plant installed in 1897 could take care of, the West Kootenay Power & Light Company started construction work on No. 2 plant. In the same year (1907) the West Kootenay Power & Light Company took over all the holdings of the Cascade Water, Power & Light Company. This was a company operating a plant at Cascade City, having a capacity of 3,000 h.p. On account of the increased business, however, the company was still not able to take care of the customers in the Boundary Country, and this was the principal reason for the West Kootenay Power & Light Company installing its No. 2 plant.

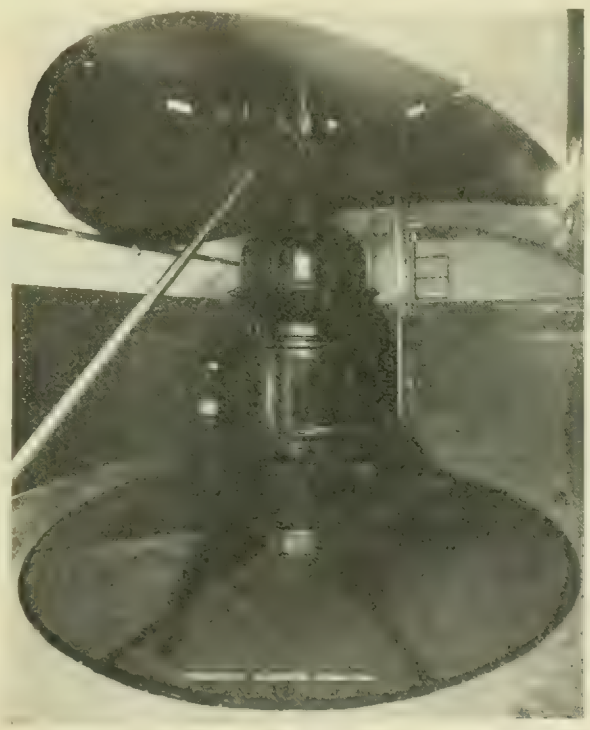
In addition to the different motors in operation at the different smelters, power is used extensively for heating apparatus in the assay offices at the different smelters and mines.

The West Kootenay Power & Light Company at the present time are supplying all customers from its No. 2 plant, and are holding No. 1 plant at Lower Bonnington, and the Cascade plant at Cascade City in case of emergencies.

Power Transmission

Power for the Consolidated Mining & Smelting Company's smelter at Trail and part of the load in Rossland is transmitted on 3-phase, 60 cycle, 20,000 volt lines, and stepped down at Trail to 550 volts (which is the voltage adopted there for all motors), and stepped down at Rossland to 2,000 volts, which is the standard voltage to practically all motors installed there. The Boundary country is connected to No. 2 power house by two 3-phase, 60 cycle, 60,000 volt lines with distributing stations situate at Grand Forks, stepping down to 440 volts; at Phoenix, stepping down to 2,000 volts, and at Greenwood stepping down to 2,000 volts. The Cascade plant, which is a 22,000 volt plant, is also arranged so that an auxiliary service can be put up at Grand Forks, Phoenix, Greenwood and Boundary Falls.

The West Kootenay Power & Light Company have actually installed ready for operation, water wheels and generators having a total output of 23,000 h.p. The total motor and lighting load connected to the company's circuits at the present time is approximately 20,000 h.p. In 1897



Power House No. 2—Thrust Bearing and Deck of one of Main Units

the total steam power installed in the territory now covered by the lines of the West Kootenay Power & Light Company did not exceed 2,000 h.p., so that this should give a fair idea of the progress made in the mining and smelting industries in Rossland Camp, and the Boundary Country in the past ten years.

The average cost of electric power throughout the area covered by the lines of the West Kootenay Power & Light Company does not exceed one-quarter (¼) that of the cost of steam power. The power supplied to the different mining and smelting industries is used for the operating of hoists up to 250 h.p.; two stage compressors up to 800

h.p. jaw crushers having an opening of 26 in. x 12 in.; rolls; blowing engines for converter work; Root and Connorsville blowers for blast furnace work, and in fact, all lines of smelting and mining machinery. The only steam power used at the smelter or the mines of the Consolidated Mining & Smelting Company is for operating one 1,000 h.p. hoist, and for heating purposes. The Granby Company use no steam power whatever, and the same applies to the British Columbia Copper Company and the Dominion Copper Company. In fact, throughout the whole Boundary Country steam power is a thing of the past.

In my opinion the harnessing of the water falls in the southern portion of British Columbia has done much to assist capitalists in developing mining properties within a radius of sixty miles of Rossland.

The following is the distance that power is transmitted to the following points:—Bonnington to Consolidated Company's smelter at Trail, 32 miles; Bonnington to Rossland, 32 miles; Bonnington to Grand Forks, 64 miles; Bonnington to Phoenix, 76 miles; Bonnington to Greenwood, 81 miles; Bonnington to Boundary Falls, 84 miles.

The 60,000 volt lines from plants No. 1 and 2, which are two separate pole lines covering the distance from Bonnington Falls (No. 2 plant), to Greenwood sub-station are each 81 miles long. On each pole line are three hard drawn copper cables having a cross section of 90,972 cir. mils. This cable is composed of six wires made up on a jute centre. The distance between centres of the cables is six feet. The following are the distances that power is transmitted over the 60,000 volt lines:—Bonnington to Rossland, 32 miles; Bonnington to Grand Forks, 64 miles; Bonnington to Phoenix, 76 miles; Bonnington to Greenwood, 81 miles; Bonnington to Boundary Falls, 84 miles.

The 20,000 volt lines running out from No. 1 and 2 plants, which are duplicate lines covering the distance from

Switch and Lightning Arrester Compartment

Bonnington Falls to Rossland, Trail and Nelson sub-stations, are of the following lengths:—Bonnington Falls to Rossland, 32 miles; Bonnington Falls to Trail, 32 miles; Bonnington Falls to Nelson, 11 miles; Bonnington Falls to Silver King Mine, 15 miles. The lines to Rossland are No. 2 B & S hard drawn bare copper wire. The distance between centres of these wires is two feet. The branch lines running to Trail, which are 3½ mile lines, are No. 6 B & S hard drawn bare copper wire, two foot centres. The lines running to Nelson are No. 8 B & S hard drawn bare copper wire, two foot centres. From Nelson to the Silver King Mine sub-station, which is at an elevation of 6,000 feet, No. 2 B & S hard drawn bare copper wire is used. These lines were built with No. 2 copper on account of the heavy snow falls.

The 20,000 volt lines from No. 3 plant, which are two separate pole lines, covering the distance from Cascade to

Map Showing Location of Power Plants and Lines

Boundary Falls, B.C., are each 28 miles long. On each pole line are three (3) No. 3 hard drawn B & S bare copper wires. The centres between each of these wires is two feet. The following are the distances power is transmitted over these lines: Cascade to Grand Forks, 12 miles; Cascade to Phoenix, 21 miles; Cascade to Greenwood, 25 miles; Cascade to Boundary Falls, 28 miles.

[The officers of the West Kootenay Light and Power Company are W. M. Doull, Montreal, president; L. A. Campbell, Rossland, general manager, and J. D. McDonald, Rossland, general superintendent.—Ed.]

Power House Additions in Edmonton, Man.

The city of Edmonton has recently purchased the following apparatus:—

One 1,000 kw. turbo-generator unit, from the Canadian Westinghouse Company; the contract covers heavy penalty guarantee on operating economy, and with penalty also for guaranteed date of operation. Two 400 h.p. Babcock & Wilcox boilers, two hundred pounds pressure, 150 superheat. One 6,000,000 low lift pump; contract with the John Inglis Company, Toronto; Inglis multi-stage turbine pump direct connected to Belliss & Morcom engine; this is a low lift pump, eighty feet head. Four chain grate stokers of approximately 95 square feet area, to burn Alberta lignite coal of approximately eighty-five hundred B.t.u.; contract for these is awarded to three companies—the Babcock & Wilcox Company, the Green Engineering Company, Chicago, and the Westinghouse Machine Company, Pittsburg. Contracts were also to be let for one high lift pump of 6,000,000 gallon capacity, to pump against the normal head of 310 feet, and a fire head of 400 feet; this pump to be of the centrifugal or turbine type, direct connected to either high revolution reciprocating engine or a steam turbine. Owing to the large amount of grit in the water for a large part of the year, this city is forced to use valveless pumps. The grit in the water wears out in six weeks' time, it is said, the best rubber valves that can be purchased.

The Sherbrooke Railway & Power Company's new hydro-electric plant has been tested and accepted and is now in operation.

Electric Smelting in Sweden and Norway

By Thomas D. Robertson

Experiments were made, under the Dominion Government supervision, at Sault Ste. Marie, Ont., in the winter of 1905-6 to test the feasibility of smelting Canadian iron ores, using charcoal as a reducing agent. These preliminary experiments were regarded as satisfactory but no further experimentation was proceeded with in Canada.

In Sweden, however, where the conditions governing the iron industry are similar to those in several provinces of the Dominion of Canada, the question of Electric Iron

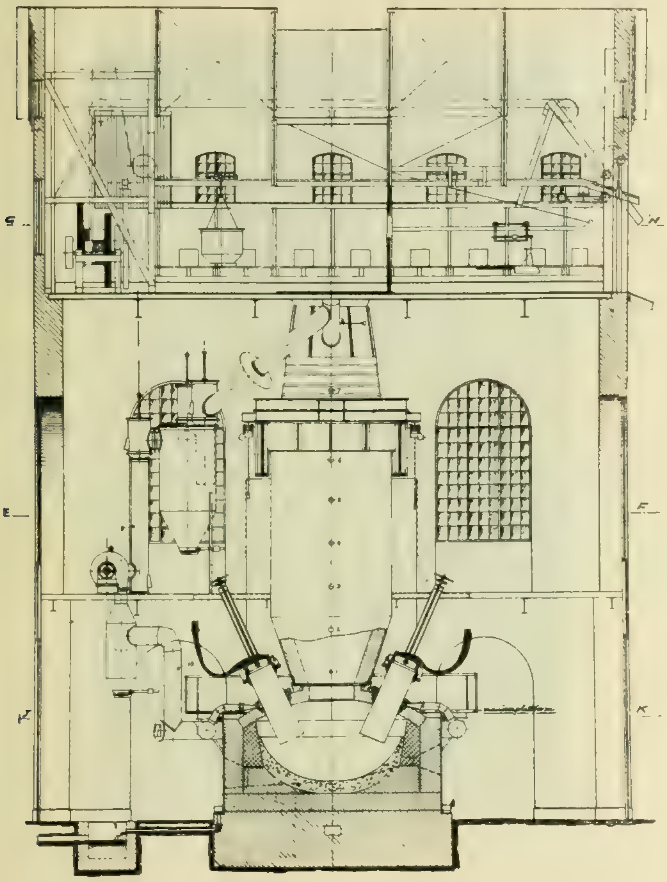


Fig. 1

Smelting was taken up in 1906. Three Swedish engineers, Messrs. Gronwell, Lindblad, and Stalhane, commenced experiments, and after overcoming many preliminary difficulties succeeded in the summer of 1908 in constructing a furnace which was durable and gave a good output.

Profiting by their experiences, they determined to build a furnace of 700 h.p. at Domnarfvet, in order to test the commercial feasibility of the furnace.

The experiments with this furnace were witnessed by Dr. Eugene Haanel of the Government Department of Mines in Ottawa, and in 1909 a report was issued giving the results.

So impressed were the Swedish Ironmasters with the working of this small Gronwall reduction furnace that the Swedish Association of Ironmasters, "Jern Kontoret," determined to erect a furnace of 2500 h.p. at Trollhattan. Their idea was to thoroughly test the furnace on a commercial scale.

This furnace was started in November 1910. Various consignments of ore were sent from the different mines of Sweden to be smelted. Most of the pig iron produced was sent to different steel works and made into steel,—the quality of which was then tested.

Before detailing the results obtained with this furnace a brief description of the plant will be given.

A charcoal storage house served by a railway track was built. This store is fitted with belt conveyors and the charcoal is elevated to the furnace top by a rope way. The ore and lime stone are crushed in a separate building and are elevated by a truck running on an inclined track. An elevation and plan (in section) of the furnace house and furnace are shown. (Figs. 1 and 2.)

Power is supplied from the Swedish Government's power station at Trollhattan, at a tension of 10,000 volts. This 3-phase supply is transformed by means of two transformers of 1100 kv.a. each with Scott connections to two phase current which can be regulated between 50 and 90 volts.

The furnace proper is shown in section in Fig. 1 and in plan in Fig. 2. Two separate portions are to be distinguished—the shaft and the crucible or hearth. The

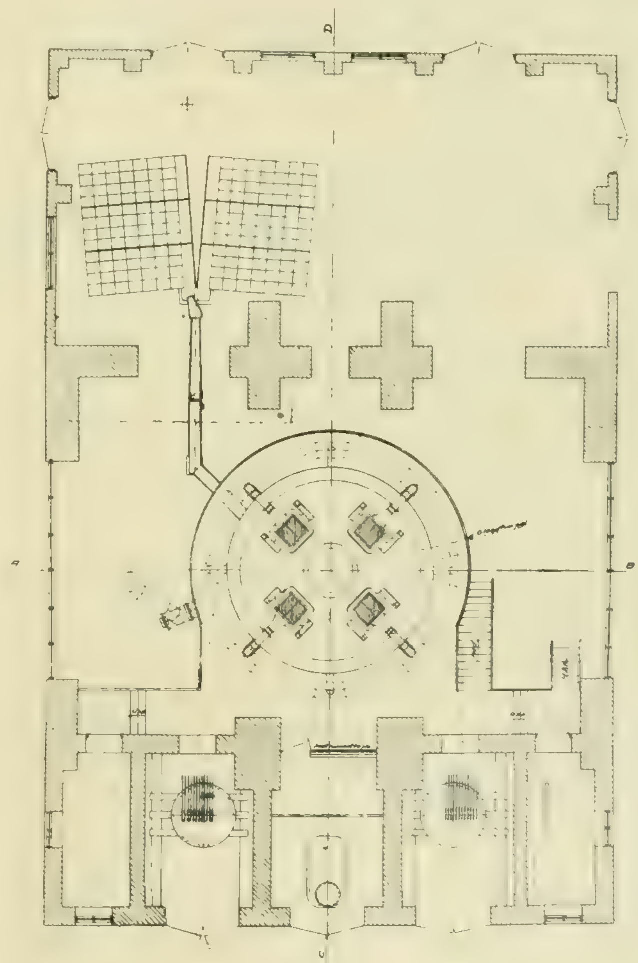


Fig. 2

height from the ground to the furnace top is 13.7 meters, (approximately 45 feet). The shaft is a cylindrical steel shell, lined with firebrick. It is fastened to an octagonal supporting ring which bears on two built-up beams, supported by the walls of the building. In this way the height of the shaft and a large portion of the charge is carried, relieving the hearth-roof of the weight. At the top of the shaft is a Tholander charging bell operated by a small motor. The object of this special bell is to deposit the ore

and limestone round the walls of the shaft, and the charcoal in the centre.

The hearth rests on a concrete foundation. It has a steel shell lined with firebrick, with an inner lining of magnesite brick. The basin shaped bottom is lined with a mixture of magnesite and tar extending nearly to the top of the walls. The roof is constructed of firebrick and has openings to admit the electrodes. These are four in number and pass through the roof at an angle of 65° to the horizontal. The electrodes are built up of 4 carbons of square section, giving a total cross section 660 x 660 mm. (approximately 26 inches square). Copper water jackets surround the electrodes at the point where they enter the roof. The contact pieces are at the upper end of the electrodes and are wedged between the electrode and a holder of cast steel. This is supported on a frame which can be raised or lowered between two guides, one on either side of the electrode.

The gas produced by the reduction of the charge is drawn off by means of a fan passing through a dust catcher, and is blown through twyers under the roof of the hearth. This gas cools the roof and prolongs its life. In so doing it becomes heated and on passing up the shaft gives most of its heat to the charge, assisting thereby in the reduction.

The arrangement for casting will be seen from the plan. The pigs cast are rectangular and flat, this shape being peculiar to Sweden. When smelting high grade ore the amount of slag produced is small and it is allowed to run out of the iron hole, the slag hole being only used for low grade ores.

The low tension copper busbars are carried to the furnace by suspended insulated holders. The current is taken from the bars to the electrodes by means of flexible bare copper cables, Fig. 3. For the various motors and lighting, special transformers are employed giving about 180 kv.a.

The furnace is equipped with all possible measuring instruments for temperature, pressure, and gas analysis, with a view to obtaining as much information as possible. The switchboard on the high tension side is provided with special registering and integrating kilowatt meters in addition to the usual volt meters and ammeters. On the low tension side there are two ammeters and four voltmeters—one for each electrode.

The smoothness of running of this furnace has been a feature from the very beginning. With electric steel refining furnaces the regulation is made by raising and lowering the electrodes, but in reduction furnaces working with gas pressure inside, this method is not practicable. In fact the electrodes are only lowered to adjust their wearing, this being done about once every fortnight. The current is regulated by altering the primary windings of the transformers and the arrangements are such that the two phases can work simultaneously with different tensions.

The burden of the furnace was constantly altered in order to obtain as much information as possible regarding the working of the furnace under varying conditions. Large proportions of finely divided concentrates were at times employed. As much as 65 per cent. caused no inconvenience in working.

Materials Used and Produced

The figures given are averages for the first 5 months ending from November, 1910, to April, 1911.

Percentage of iron in ore	61.51
Percentage of iron in the charge	57.00
Slag per metric ton of iron	719.4 lbs.
Charcoal per metric ton of iron	793 lbs.
Time of working	3348 hrs.
Time consumed in interruptions	153 hrs.
Total time	3501 hrs.
Average load (kw.)	1344
Total kw. hrs. used	4,500.596
Iron per kw. year	3.66 tons
Consumption of electrodes per ton of iron	11.59 lbs.

The sulphur in the ore averaged 0.02 per cent. and the phosphorus was usually below 0.01 per cent.

The resulting pig iron usually contained about 0.01 per cent. of sulphur and phosphorus. The gas produced is very rich, containing over 80 per cent. combustibles. It was allowed to burn into the air, but arrangements are to be made in new plants to utilize it.

Steel Produced from Electric Pig Iron

Most of the iron produced was sent to various Swedish works and converted into steel in open hearth furnaces.

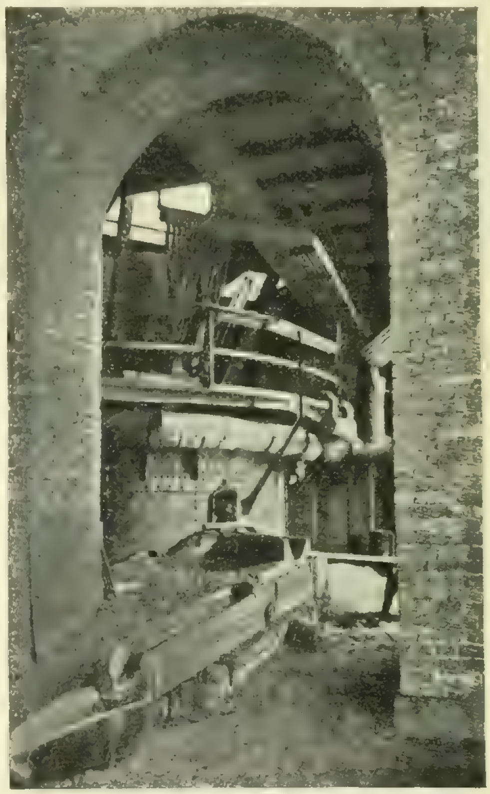


Fig. 3

These were both acid and basic, and tests on the steels produced show them to be equal and in some cases superior to steels made from charcoal iron from the same ore. An interesting feature is that low carbon iron made in the electric furnace can be successfully made into high quality steel in the open hearth furnace, with a considerable saving of time over ordinary pig iron.

Proposed Alterations

The experience gained at Trollhattan has suggested several new improvements. When the author left Sweden in May of the present year it had been decided to shut down the furnace early in June in order to make some alterations. Owing to the rapid perfecting of electrode manufacture it is now possible to obtain round electrodes in one piece of the necessary diameter. These new electrodes are fitted with screw joints so that they can be completely consumed, in this way obviating waste due to stump ends. New electrode holders have been made which will grip the electrodes just at the point where they enter the roof, thus minimizing electrical losses.

A water scrubber is being installed in place of the dust catchers, the latter not being very effective in removing fine particles. The hearth and roof will be rebuilt and it is confidently believed that the furnace will then be ready

for a campaign of eighteen months continuous working.

The furnaces at Trollhattan have been worked continually with charcoal, but four furnaces are being built in Norway which will work with coke. The shaft for these is lower and wider and has a smaller volume than that of a charcoal reduction furnace. It may be possible with a modified gas circulating apparatus to use raw coal, but this has not yet been tried.

Gronwall Reduction Furnaces

The following Gronwall reduction furnaces are either working or in course of erection in Sweden and Norway:—

Sweden.—	Trollhattan (after present alterations are completed)	3,000 h.p.
	Domnarfvet, one furnace	4,000 h.p.
	Hagfors, two furnaces (3,000 h.p. each)	6,000 h.p.
Norway.—	Tyssedahl, Hardanger, two furnaces (3,500 h.p. each)	7,000 h.p.
	Asendal, two furnaces (2,500 h.p. each)	5,000 h.p.
		25,000 h.p.

Owing to the larger and better electrodes now obtainable the author is informed that it will now be possible to construct units up to 6,000 h.p.

With the exception of Trollhattan, all the furnaces use 3-phase current and have six electrodes.

Electric Smelting versus Blast Furnace Smelting

Each electric furnace unit is smaller than the average blast furnace, a 5,000 h.p. furnace making fifty tons per day. This is an advantage in some respects.

The time taken for repairing or relining is small; the financial loss due to wrong composition of the charge is reduced to a minimum.

There is less material handled per ton of iron made in the electric furnace, and there is practically no risk of accident and loss from scaffolding.

Large percentages of fines may be smelted in the electric furnace, indeed it is expected that by designing a special shaft all fines may be worked.

Ores high in sulphur which cannot be smelted in the blast furnace can be used to produce low sulphur iron in the electric reduction furnace.

As seen above the superior quality of the product over coke pig iron is undeniable; it is equal to the best charcoal iron.

The cost of production varies in different localities, some localities being suited for electric smelting and some for coke smelting. However, the following statements apply generally,—To make three tons of pig iron in the electric furnace uses one ton fuel (coke or charcoal) and one h.p. year. In the blast furnace three tons of fuel are used to make three tons of pig iron. The electric furnace therefore substitutes one h.p. year for two tons of fuel. There are many localities having water-power awaiting development, with iron ore close at hand. To many of these the freight costs for importing fuel make blast furnaces too costly. Into such places the electric furnace will come to be the best apparatus for the profitable production of pig iron.

Address Delivered by Mr. Samuel Insull

President Commonwealth Edison Company, Chicago, at the Luncheon of the Canadian Electrical Association, June, 22, 1911

For a number of years past it has been my privilege to take a very active part in the affairs of the National Electric Light Association, and I should like to refer for a few moments to the work of that association with which you have become recently more or less affiliated, and tell you some of the things that the association has done for the industry in the country on the other side of the gorge.

In speaking of the subject I want you to bear in mind that I am speaking from the point of view of a man responsible for the investment of vast sums of money in electrical enterprises, and therefore as one who is forced to look at it from the point of view as to whether associations of this kind are likely to be of material benefit and of financial advantage to the various companies with which you gentlemen in this room are connected. In my judgment the work of the National Electric Light Association has done more for the improvement of the commercial methods and the engineering methods of the electrical industry in the United States than has any other one agency since the early work of the inventors who first gave us the various electric light and power systems which we are engaged in operating. This association has aided very materially in fostering pleasant relations between our various member companies, and the communities in which they do business. It has added very largely to the knowledge of our employees, and consequently has added very much to their efficiency and we are now engaged in endeavoring to introduce schemes amongst our member companies with reference to such things as pensions, savings-funds, insurance and the like, for the purpose of adding to the material welfare of the employees of the various companies who are members of our association.

The business in which we are engaged probably has few parallels in growth in the industrial world. Three decades ago there was scarcely more than a few hundred thousand dollars invested in it, while to-day there is probably a billion and three quarters of dollars invested in the electric light and power industry in the United States and Canada, and there is probably employed by the various companies from one hundred to one hundred and fifty thousand men; moreover, notwithstanding its remarkable growth, the business has, on the whole, paid handsome returns on the capital invested. It is a business which is probably less affected by panic and depression, which we must expect from time to time, than any other public service industry. This may be partly owing to the fact that we are engaged in a new business, and that we have not reached the point of saturation, and our efforts to extend our operations are somewhat sharpened when we find periods of depression in general business approaching.

Being at this location, right in the centre of what is popularly supposed to be the greatest power development on the North-American continent, naturally one would refer to the question of hydraulic development, but it happens that practically my entire experience, with the exception of a few isolated cases, has been confined to steam development. Sometimes I wonder why it is that the public, whether they are in Canada or the United States, look upon Niagara as the greatest power production centre in this country. My own impression is that the greatest power production centre in this country at the present time, if you include all the various electric light and power companies and transportation companies, the greatest power production centre in the United States is in the City of New York

I want to add, however, and I say it with all modesty, and with the recollection of Mr. Grier's remarks with reference to the possible boasting characteristics of the people who live on the other side of the line (and in respect to that point it is at least one quality which they have inherited from their English forebears) I would repeat, I say it with all modesty that I think the largest steam-electric power production centre in the United States operated by one company is probably in the City of Chicago and the company is that of which it is my honor to be the president.

There are a number of gentlemen in this room whose business is menaced more or less by the hydraulic development on the Canadian side. I want you, when you go home, to figure out what is your investment per kilowatt of maximum output, and divide that investment into two classes, one the generating investment and the other the distribution investment. You will find that your average investment —which I do not think is any different in Canada than in the United States in this respect—you will find your average investment in the distribution system is just about five or six times your average investment in your generating plant. So when you hear that Niagara power is coming into your midst, and that the investment for the production of Niagara power is apparently some absurdly small sum per kilowatt of maximum output, please remember that before that hydraulic development can be used to any extent in your community there must be invested exactly the same amount of dollars in a distribution system as you have had to invest, and that your case is by no means so hopeless a one as it would appear to be if you just take the information on the surface—the apparently correct information—and do not go to the bottom of the thing.

I suppose some might consider this a wild statement to make, but I have thought for a good many years past that a steam generating plant located in the city of Buffalo could compete, under the conditions under which power is sold in Buffalo and must be sold in Buffalo, owing to the conditions under which business is done, and the conditions under which people live, and so forth, with electric energy brought from one of the hydraulic plants here at the Falls.

I want to say to the young men attending this convention that I know of no business which offers so great possibilities of advancement and for an honorable career as the business that we are engaged in. Some might say that it is natural I should make such a statement because I know no other business, but speaking from my own experience, and speaking from the experience of a great many young men who have grown up with me in this business, a great many men who to-day are looked upon more as the fathers than the sons of this industry, I say I know of no business that affords greater opportunities for you young men. The positions that you can achieve, the advantages that may accrue to you in the business rest entirely with you. You have before you the opportunity to obtain the knowledge to fit yourselves to occupy positions of prominence in this country, and naturally those positions must bring with them the advantages and the emoluments that come with prominence and that come with success. It is simply a question of whether you will rise to the occasion when it is opportunity to gain a knowledge of the business that is offered to you and whether you will grasp the opportunity that is before you. Whether you are in a small country town or in a large city you should take advantage of the right at your hand. I know of no better agency by which to get that knowledge of your day to day work than by forming a connection with such an association as yours or the National Electric Light Association. I know of no place commercial knowledge, better advice as to what to do under all kinds of circumstances, than you can get from the National Electric Light Association and its affiliated body, the Canadian Electrical Association.

To those gentlemen here who are responsible for the operation of properties I want to say that they cannot spend their company's money to better advantage than by sending their young men to meetings of this association, if the meetings are of such a character as the one I attended this morning, (Hear, hear) and in offering them that advice I am only preaching what I practise and what is practised by the managers of all the large electrical properties in the United States. We only limit the number of men that we send to our conventions, by the necessity of considering the question of how we can get along in our business with so many men absent.

Before I sit down there is one other subject to which I should like to refer. It is a subject that was referred to, I think, in two of the papers this morning, and that is the questions of the relations between the operating companies, the public utility companies, and the communities in which they operate. This is a question that has been very much discussed in the last few years. The old method of doing business was to assume that a public utility was a kind of supreme being that could not possibly make a mistake, and if the community in which it operated was not satisfied with the methods, why it must just put up with them. I care not how good may be the franchises under which you operate, how long may be the grants you have, how able may be the management of your property so far as the engineering side of it is concerned, or how good may be your engineer and how perfect your plants, unless you can so conduct your business as to get the good will of the community in which you are working, you might just as well shut up shop and move away.

This matter of public relations is one that has been brought home to a great many industries, not only public service industries, but all classes of industries in the United States in the last few years, and I think you people on this side of the line might very profitably study what has been going on in connection with public opinion in the United States, and the relation of public opinion to corporate affairs.

Most of the troubles that have occurred in the United States found their origin in an absolute neglect of public opinion in the case of general industrial corporations, and in a neglect of local good will on the part of the local public service corporations. Having obtained a franchise if you are men dealing with the public from day to day, the first thing you want is their good will, and if you are managers of properties the first thing you want on the part of your employees is to see that they do everything to get that good will. I do not mean to say that you should give way to every whim or caprice, or that you should bow to every demand of the politician who is bidding for public favor. That is not at all necessary in order to get general public good will. You have to remember, as one of your members stated in his paper this morning, that the community are your customers, and that you have to put yourselves in the position of your customers. Supposing one of you went into a store to make a purchase and you wanted a certain article, say an article of apparel of a certain color, say white, what would you think if the clerk behind the counter reached up for a roll of goods and said, "Well, our rule is you have got to take green." You would walk out and go somewhere else, and if you wanted white you would buy the article at some other place. Now, there are a great many things that public utility companies do that are just as absurd as that, and my last word to you is, above franchises, above all questions of money making, (because that will help you to make money) above all questions of engineering, consider your relations with the community in which you are working and in which you have to live, because your plant cannot be picked up and moved away.

Twenty-First C. E. A. Annual Convention

A Record Attendance—Papers of a High Order—Discussions Helpful, Vigorous, Pointed—Niagara Falls an Ideal Spot for Combining Business and Pleasure

The twenty-first annual convention of the Canadian Electrical Association, held at Niagara Falls, Ont., on June 21, 22 and 23, was a decided success in point of numbers, excellence of papers presented, helpfulness of the discussion and good fellowship. Over four hundred delegates attended the convention, probably the largest number in the history of the association. The president, Mr. A. A. Dion, presided throughout. An interesting part of the proceedings was the conferring of a life membership on Mr. J. J. Wright, the first president of the association, who briefly expressed his appreciation.

The president, in his opening address, spoke of the affiliation of the Canadian association with the N. E. L. A. He expressed the belief that "access to its publications and sharers in the results of its extensive and well-organized committee work on all kinds of live special subjects cannot fail to be of the greatest benefit, not only to individual members, but in a greater degree, to the companies they represent." Mr. Dion also touched on a former suggestion of Mr. Frederic Nicholls that some useful function be allotted the ex-presidents of the association. The President thought these might very properly form an advisory board to the managing committee and be entrusted with such matters as Public Policy.

The secretary-treasurer's report showed a satisfactory balance at credit of the association. The report also summarized correspondence with the Postal Department re the issuance of one cent stamps in rolls. The Department has not yet taken action in this matter.

Substantial appreciation was shown of the valuable work done by the Convention Committee, of which Mr. W. L. Adams was chairman.

The following officers were elected for the ensuing year: president, A. A. Dion; vice-president, R. F. Pack; second vice-president, W. L. Adams; third vice-president, W. L. Bird; secretary-treasurer, T. S. Young; executive committee, W. C. Hawkins, A. L. Mudge, C. E. A. Carr, D. H. McDougall, F. A. Chisholm, L. V. Webber, W. Phillips, J. H. Larmouth, J. S. Norris, I. H. Wright, J. W. Pursell, R. H. Sperling, J. W. Crosby, R. B. McDunnough.

Mr. Gilchrist's Address

The proceedings were pleasantly interrupted during the morning session of the second day by the introduction to the convention of Mr. Gilchrist, of Chicago, the newly elected president of the National Electrical Light Association. Mr. Gilchrist spoke briefly on the pleasure he experienced on this his first visit to the meeting of the Canadian Association and on the value of such associations and their discussions, to the attending members. We are living so rapidly in the electrical business that there are practically no text books which are right up-to-date, so that our information must be obtained from one another by the comparing of notes and ideas as to one another's experiences. Mr. Gilchrist emphasized the fact that central stations are in business for the twofold purpose of serving the public thoroughly and well, and for making dividends for the shareholders. The most intelligent thing to do is to surround the whole fabric with the good will of the public. Ideas of sharp practice should have no place in the operation of a central station. Sharp practice makes bitter enemies. Honesty is the best policy. Rather let it be an easy matter to beat the company on the first deal.

Following is a review of the various papers read and of the discussions which followed:—

Operating Safeguards

By E. Little, Operating Superintendent, Kaministiquia Power Co.

The object of this paper was to pass in review a few of the necessary safeguards for up-to-date operating, emphasis being laid on those points which had come prominently under the writer's notice. The subject of safeguards was classified under two general headings. (1) Safeguarding life and property. (2) Safeguards to insure continuity of service.

Oil Switches and Circuit Breakers.—Mention is made of a type of switch used by European engineers for high tension switching of transformers. This switch has an intermediate set of contacts connected to a suitable resistance over which the moving contacts pass, and is so arranged that the transformers are not subjected to the sudden strain of the full line potentials, either when closing or opening the circuit.

Protective relays.—These must be chosen with special reference to the peculiar local needs of the plant. Where several are used between the generator and a given point in the distribution, care must be taken to decrease the settings step by step outwards from the generator. For transmission lines and feeders in multiple the reverse current relay built on the principle of the wattmeter is giving satisfactory service. These instruments are especially suited to the large systems where they are superior to the solenoid type.

Lightning arresters.—Mr. Little's company has finally installed electrolytic arresters of the aluminum cell type, although on the low tension lines the multigap or the Garton type of arrester is giving good satisfaction. As a result of trouble this company is making a trial of a heavy fuse in the ground connection of each set of arresters. Special emphasis was laid on the necessity for careful installation and supervision of the aluminum cell arresters. Mr. Little charges his every 12 hours, thus keeping the cells in a uniform condition. The setting of the horn-gaps is a matter requiring careful study of local conditions. Ground connection should be of the best and of ample capacity. In stations where the ground plate is used it is considered good practice to supplement this by the driving of iron pipes at intervals about the station, and bonding them together, with the existing ground.

Ground Detecters.—Every distributing station operating with delta connections should have ground detecters. They should be so connected as to indicate a ground on any part of the distribution system, and at the same time be provided with means for locating which of a number of circuits the trouble is on. The writer spoke of a peculiar case that had recently come under his notice where a wireless telegraph station had been put out of commission by an undetected ground in its immediate neighborhood which suggests the value such an apparatus might be to the central station operator.

The paper further deals with malicious interference

with lines which often causes shut downs, especially if the company is unpopular in the district. To avoid accidents to workmen they must be drilled in caution, and concentration on the work in hand. The admission of the public to the power plant is a doubtful kindness and the greatest care should be observed in pointing out the necessity for caution. A cabinet of emergency tools, and another of medical supplies should be maintained by each department. Drill for instruction in first aid, in cases of electric shocks should be given. It is advisable to encourage the public to co-operate with the power company and report any trouble noticed on the line. A thorough understanding as to the precedure in cases of emergency should exist between the various members of the operating staff. All power consumers, school principals, teachers and doctors and policemen should co-operate with the power company in safeguarding life and continuity of service.

Discussion on Mr. Little's Paper

In opening the discussion, Mr. Kemble spoke strongly on the necessity of the operating department using every possible effort to stop trouble without causing an interruption on the lines. Mr. Kemble said that the smoothing out of all other complaints was an easy matter compared with troubles which arose from discontinuity of service. Mr. Pack, Mr. I. H. Wright, and Mr. Glenn Marston, all spoke on the question of protecting the public by signs, wire screens or educational campaigns. It was pointed out that unless these matters were handled tactfully, people might get the impression that electricity is dangerous under all circumstances, when as a matter of fact it is absolutely harmless when properly controlled.

The president, Mr. Pack, Mr. Kemble and Mr. T. C. Martin, spoke on the steps that might be taken in connection with the training of those who have to do with electtrical matters, in "First Aid to the Injured." Mr. Martin pointed out what the N. E. L. A. had done in this respect and stated that he hoped during the coming year to have a special report completed containing valuable information on this important subject.

Advantages of Publicity to the Central Station Industry

By Glenn Marston, Chicago

Publicity means nothing more than getting before the people, preferably in a favorable light. Newspaper publicity falls broadly into two classes—paid advertising and free reading notices. Paid advertising should be used to call the people's attention to features of the company's business which are not essentially new. Free reading space is almost always gladly given, when something of news value occurs concerning the company.

The author is unalterably opposed to payment for reading space in newspapers. There are innumerable items of interest which the papers will print gratis, or short stories or articles on popular electrical topics will be gladly accepted. This will keep the electrical idea before the public. On the other hand newspapers subsist largely on their advertising, and it is only right that the companies should pay to advertise their products, as other manufacturers do. It is of great importance to direct the demand for electricity along lines which will best increase the earnings of the company, such business for example, as long-hour commercial lighting, including window, store, and sign lighting. This latter is a live advertisement for an electric company, as well as for the merchant.

Publicity can be made an effective agent in levelling the load curve. If the power load is low, power should be developed [illegible] If a station has an inverted curve publicity can be used to build up the night load. Always advertise with some specific object in view, and in such a way as to interest and instruct the readers. When convenience is a consideration, price is a secondary matter. People should be convinced that the convenience of electricity makes it cheap, at any price

Discussion on Mr. Marston's Paper

A vigorous discussion on the value of advertising of different kinds followed the reading of this paper. Mr. Martin favored newspaper publicity as compared with, for example, private publications, and brought up the question of bill posters, posters in windows, exhibitions of devices in operation, patronage of electrical exhibitions, leaflets and dodgers and letters of a circular character. Mr. Marston in general favored the newspaper. Mr. Kemble referred to the necessity of exercising judgment in selecting new business. Mr. I. H. Wright had not found local advertising of great value, but favored large bill posters, canvas signs, and so on. Mr. J. H. Larmouth also believed that much money was wasted in newspaper advertising as in the smaller towns he believed advertisements are not as fully read as in larger places. Mr. Larmouth described a very complete system of card indexing being perfected by his company in a number of towns. The President brought up the question of wiring houses for the poorer classes of customers on the instalment plan, in reply to which Mr. Marston described a number of experiences in which this plan had worked out to the advantage of the customer and the central station alike. This class of customer will look askance at a lump investment of $28, but will readily accept a proposition to pay $4 down publicity ideas brought out by Mr. Martin. Mr. Black spoke of the value of cartoons. Many people will look at a picture when they will not take the trouble to read an article, and if a cartoon can be made sufficiently expressive the desired result is obtained.

Service Protection

By George R. Smith, New York Edison Company

The author dealt with the various devices that may be installed to safeguard the company's interests, where customers are inclined to take advantage of any possibility of obtaining current without paying for it. The author is of the opinion that while there may be few electric light users who would deliberately make a permanent illegal connection, yet, there are many small ways, which grow on the consumer, in which the company is defrauded. A number of devices are described which make it impossible for the consumer to get at the lead wires of the company before they reach the meter, such as sealable cut-outs, refillable porcelain fuses, terminal protectors, non-magnetic wiring frames for meters, seals, &c.

The development of service protectors has also been carried along lines to facilitate and accelerate the testing of meters without in any way interfering with the functions of the apparatus, or with the continuity of the customer's service.

Discussion on Mr. Smith's Paper

The President opened the discussion. He agreed that the need for protection devices is getting greater every day. In the beginning people had a sort of fear of electric appliances which prevented them from interfering with them, but they were getting over this and were not hesitating to tamper with the wires where there was a fair chance of not being caught. Mr. Pack spoke of the value of a definite set of rules for customers' installations and questioned as to whether wiring contractors and others could be made to live up to them. Is it possible to enforce definite rules regarding installations and interior wiring, where the meter

should be installed and about the testing of it, and so on? Mr. Webber raised the question as to whether it would pay a company to install a device of this nature when nobody knows how much current is being stolen. He suggested the plan of putting it in in suspected cases only. Mr. Chisholm, answering Mr. Pack's question, stated that his experience with regard to standard rules was that they did not work. His company were installing protectors gradually on every meter, making the instalment on the suspected class first. They had found a good deal of stealing going on. Mr. Garner spoke briefly along the same line. The President concluded the discussion. He spoke of the difficulty of prosecuting citizens even where evidence was quite clear. The Underwriters' rules are so strict at the present time that it is practically impossible to protect the lines as they should be protected.

General Accounting

By C. E. Bowden, Auditor, Toronto Electric Light Co.

Mr. Bowden dealt with the problem of scientific management. This idea means the conservation of labor, and material; it deplores waste, believing it can benefit no one, neither consumer, corporation, nor employee. This condition can be brought nearer by careful study of conditions. Under scientific management every department is brought under the scrutiny of experts in their own particular line of work. The efficiency of the entire plant should be raised to the highest possible degree. It is not now so much a question of increasing the gross revenue, as of lowering the ratio of the operating expenses.

The science of accounting is an exact one just as other sciences are. Broadly speaking it is divided into two branches, the financial and the operating. The operating branch may be divided into three classes. (1) A system of timekeeping, and pay-roll accounting. (2) A system of handling and accounting for material purchased. (3) A cost system. Especially it has been true that the accounting of the stores has been kept in a very loose manner. This tends to wasteful use.

The paper fully outlines the methods of keeping these accounts, and of preparing periodic statements, and emphasizes the necessity at the present time for every company's improving and perfecting its system from within. Emphasis is laid on the fact that the present tendency is towards a reduction in rates which means that the only remedy for the central station must come through the introduction of a more scientific and systematic attempt to secure efficiency, and through efficiency, the fullest possible results from every detail of the operation of the business.

Mr. Pack, in his report on this subject, expressed regret that more interest had not been apparent on the part of central stations and more inquiries made to the committee in charge. He expressed satisfaction at the action of the Hydro-electric Power Commission of Ontario in adopting a uniform system for all municipalities and stated that the accounting systems of electric lighting and power stations, whether publicly or privately controlled, would now be practically identical.

Discussion on Mr. Pack's Report of the Committee on Uniform Accounting and on Mr. Bowden's Paper on General Accounting

The president, Mr. Kemble, Mr. Pack, Mr Chisholm, Col. Street, Mr. I. H. Wright and Mr. Larmouth, all contributed to the discussion and all agreed on the value of a uniform accounting system in the central station business operation. The only question seemed to be whether such a detailed system as that described by Mr. Bowden or as suggested by the association a year ago, would be applicable to the smaller stations. It was felt by some that the expense might be too great. The system was defended, however, even for the smallest stations, by Mr. Pack and Mr. Chisholm, the latter stating that when the system is once properly working it requires very little time, not at all out of proportion to the benefits accruing and time saved otherwise, and in definite information obtainable as to your financial standing. It was agreed that the accounting department had now become practically a profession in itself, a technical subject like other departments of electrical affairs.

Joint Report of the Meter Committee, and the Meter Inspection Committee

This report outlined the progress that had been made towards the reduction in meter testing rates throughout the Dominion. The correspondence between the department and the committee is given, and the final satisfactory results explained. In making this report the committee explain that the reduction in rates was not as great as they had asked for, or hoped for, but that they were forced to be content, in as much as the government had assured them that the reduction made was as great as could be given without producing a deficit in this section of the departmental work. The rates are given on another page in this issue. The report also includes a minute description of the Canadian system of government control of electric light and power service, and speaks of the legalized electrical units for Canada the Electrical Standards Laboratory with the fees charged, the regulations under which the laboratory is conducted, and gives a brief description of the apparatus contained in the main laboratory at Ottawa, and in the sub-laboratories scattered throughout the Dominion. At the end of the report the important feature is pointed out that the meter inspectors must pass a quite difficult examination presided over by a competent board of examiners, of which Mr. Ormond Higman, the Chief Electrical Engineer of the department is chairman, and a typical examination paper is appended. The statement is made that there are now between 150,000 and 200,000 meters in use, in Canada, which number is being added to at the rate of 15 to 20 per cent. yearly.

Testing for Errors in Polyhase Meter Connections

The meter report is supplemented by a very interesting paper on polyphase meter connections, by Mr. H. S. Baker, of the Ontario Power Company. The paper states that when polyphase meters are first connected in, and started up, it is much more common that the connections are wrong than right. In view of this fact the author describes in more or less detail a number of methods for testing out connections.

Metering Under Two-rate Contracts—As Practiced in Montreal

The meter report was also supplemented by a short article, by Mr. P. T. Davies, descriptive of the methods used to supply the customer with current at different rates at different times of the 24 hours. A difficulty lies in the fact that these pieces of apparatus are not dependable, and that there is no data on which to rectify an error which may have been made by the clock mechanism during an interval that is passed. In Montreal a recording volt meter is put in to check the operation of the switch. The arrangement provides for two meters for use at different times of the 24 hours with the series coils in multiple, and the shunt coils controlled by a hand switch, while the time recorder is connected in so that it shows when the shunt circuits of either meter are energized, thus giving a general record of the switch operations. The paws of the switch are so arranged that the switch blade must make contact with one or the other. If the switch is left in a central position, both

the meters read. This arrangement protects the company from the shutting off of both meters.

Until recently time recorders were only manufactured for low voltage d.c. circuits, but latterly a type has been designed, which will operate on a 110 volt a.c. current quite reliably.

Following the Reading of the Report on Meters

Mr. A. B. Lambe reviewed briefly the Canadian system of inspection of electric light and power services. He pointed out that in reality the surplus shown in the account is more apparent than real. In connection, for example, with the inspection of disputed meters in situ the fee of $1.00 would be purely nominal and would not begin to cover the cost of the work. Mr. Lambe briefly explained the laboratory and its apparatus and stated the willingness of the department to take up any criticism of the association and remedy any grievance where this would be at all possible. Mr. Pratt spoke on Mr. Davies' paper. In Hamilton he found the customers honorable and willing to carry out their contract with the exception of perhaps from 5 to 10 per cent. For the most part only the large power users are on the off peak load and these look at the question from a broader standpoint than the very small users might do. Mr. Dion was not so optimistic about the honor of the consumer. He believed that it was necessary to install protective devices wherever possible. He also spoke of the probability of many of the off peak customers being a loss to the company in that if this class of service were not given they would actually be peak load customers paying a higher rate. The President and Mr. Lambe spoke on Mr. Baker's paper, "The Testing for Errors in Polyphase Meter Connections."

Some Notes on Central Station Management

By Wills MacLachlan, Local Manager Trenton Electric and Water Co., Belleville, Ont.

The idea of this paper was stated to be, simply to outline a plan of discussion which it might be profitable for central station managers to follow. The modern central station man on account of coming in contact with many different classes and types of human nature has to combine, in a sense, in his own make-up, the characteristics of all of the different types. He should study to develop the faculty of adaptability. The same characteristics should be expected of the assistants. All customers, and inquiries should be treated with the greatest courtesy. A little neglect will often start a grievance, which will grow out of all proportion to the original cause. There should be staff meetings where matters of common interest can be discussed and prejudices between the different members of the staff cleared away. A manager should be able to choose his men well for the various positions they are required to fill.

It will usually be found to be an advantage to both the central station and the municipality, if they can get together on some common ground, and work out the fairest proposition for both parties. This is now accomplished in certain quarters by placing the rates and regulations of the central station in the hands of a commission which should protect both the municipality and the central station.

Emphasis was laid on the necessity of the central station manager showing himself an interested citizen of the town he operates in for the time being. He should join the various clubs, the board of trade, etc., and get in touch with the business men, the manufacturers, and the professional men of the town.

A point of great importance was also brought out in the suggestion that the central station manager should be a sort of consulting engineer for his various customers. They should feel that the manager will advise them to buy apparatus or make such installations as will be in their best interests, in short, that he will consider their interests, rather than his own. In doing so the central station manager will undoubtedly, in the long run, create a condition which will operate in the interests of the company he represents. There is no asset better than a feeling of confidence by the customer, in the central station manager.

Discussion on Mr. MacLachlan's Paper

Mr. Marston agreed on the necessity of a central station manager developing the faculty of adaptability. This would be especially the case in a small plant. Mr. Marston believed this faculty can be developed just as any other faculty. People are not necessarily born good mixers. The value of such a man in even a small plant is unquestionable and a company would be well repaid by paying a fair salary to get a proper type of manager. Col. Street took issue with Mr. MacLachlan's suggestion that the meter reader could render valuable assistance to the company in that he came more closely in touch with the customer than any other member of the staff. Col. Street said that in his opinion the meter reader should have nothing whatever to say in the houses. If a complaint were made to him he should simply report it. The type of men who can read meters only is not generally of sufficient intelligence to further the interests of the company where such complaints are at issue. Mr. Wright also thought the meter reader had no time to attend to complaints. Mr. Kelly thought the suggestion of a municipality and central station getting together and discussing rates an extremely good one. He thought the Ontario government might appoint some such a commission as the Ontario Railway and Municipal Board which might control rates. Mr. Pratt questioned if such a commission would protect the company from competition. Mr. Marston

in reply to Mr. Pratt stated that in the United States, where there were a number of public service commissions, it was an unwritten law that competition should not be allowed. Mr. Moore spoke on a case where such a board had prevented the lowering of rates where the people in the town asked for it.

The Relations of Public Utility Corporations with the Public

By G. B. McNabb, Business Manager, Montreal, Light, Heat and Power Company

Mr. McNabb reiterated throughout the necessity of friendly and cordial relations between the utility corporation and the public. The public like courteous treatment, and are very susceptible to it. The object of the corporation should be to give the consumer the most value for his money, consistent with good business judgment. The requirements and wants of the public should be studied, their goodwill cultivated in every way. The dealings with the public should be always straightforward, and above board.

Too much attention cannot be paid to complaints. A crak makes the best kind of a friend if once won over. Orders for service should be executed promptly to give the customer a favorable impression at the start. Discourtesy, or lack of diplomacy on the part of one employee of the company can do more harm in ten minutes than the rest of the company can right in a week.

There should be no discrimination among customers of the same class for the same kind of service. No man likes to be discriminated against. Make the rates as simple as possible, so that they may be understood by all.

A central station should be interested in the general welfare of the community it serves; should endeavor to be a part of that community, and should be willing to assist in any public spirited movement, which would benefit the entire municipality.

Discussion on Mr. McNabb's Paper

In the discussion which followed the reading of Mr. McNabb's paper the president spoke of the great need of getting employees to realize the necessity of courtesy towards the public. This is important down to the least of the staff. A very large percentage of the customers know no one in the company except the young men to whom they speak when they come into the office and necessarily their ideas of the company are based on the ideas they get of these young men. Mr. Marston spoke on the point brought out about getting the public to understand that the central stations are not robbers. The public really does not know how much a central station is doing for the health and safety and general welfare of the community and it is up to the central station to explain. In as far as possible the customer should understand the reason for different rates for different kinds of load and it should not be too much trouble to show them how a lighting customer is charged six or seven times as much as the power customer and that still the power customer is more profitable than the lighting customer. Col. Street spoke of the necessity of answering the telephone with tact. A gruff or short answer will irritate a customer and cause the loss of service quicker than anything else. The president also emphasized the necessity of having a somewhat better educated class of boy or man on the telephone. Mr. George Goring believed in the value of a crank if his friendship could once be obtained. The crank is necessarily a fighter and if he can be won to the company's side it is that much to the good.

Some Notes on New Business Getting

By Parker H. Kemble, General Sales Agent, Toronto Electric Light Company

Mr. Kemble divided new business into four classes. (a) Where there is no service on the customer's premises. (b) Where the service has been installed, but not used by the present tenant. (c) Re-signs, the continuance of business from one year to another. (d) Additional business on the premises of an existing customer.

Class (a) requires the greatest expense on the part of the company and the greatest discrimination. All business is not profitable. Customers should be sought whose demand is likely to grow.

Class (b) represents less expense to the company but generally more to the solicitor, based on the fact that the customer probably had some good reason for not using the service before.

Class (c) as a rule requires little expense, or effort.

Class (d) represents no expense on the part of the company, and is almost invariably profitable.

The paper draws the conclusion that the place where discrimination can be most profitably used is in class (a), that is, in the canvassing of entirely new business. With this question is involved the method of payment of the solicitor. If the solicitor is out to bring in business for his company, of whatever kind, he will often sign business which will turn out unprofitable. The greatest discrimination is necessary. The writer believed that exactly the same laws may be applied to the getting of business under class (a) as in any manufacturing business, where the product manufactured is intended to be sold. In saying this the author wished it to be understood that the educative value of getting service into a customer, even in very small quantities, cannot be overlooked, but that in very many cases what is overlooked is that there is no possible chance

for many of the customers to expand and become increasingly profitable to the company.

The paper emphasized the necessity for the salesman having a thorough knowledge of his district. He should know its needs and the needs of every particular industry represented in it. He should have a personal acquaintance with the business men's associations, and even with the political situation. In this way he not only knows what is happening, but gains a fair idea of what is going to happen in his district. He forsees coming business for his company and avoids pit-falls in the way of bad accounts.

It was also emphasized that the greatest care should be exercised in making preliminary statements to the customer as to the capabilities or probable cost of service. This sometimes makes it more difficult to sign up customers, but an easier matter to please them afterwards. A new customer should receive careful attention to see that his service is working properly. With all customers, changes in the outfit should be suggested without hesitation where this would reduce bills, or increase the efficiency of his installation. The customer should pay for what he needs, not for what he can be loaded up to take.

Discussion on Mr. Kemble's Paper

The discussion on this paper turned largely on the payment of solicitors. The president spoke of the necessity of discriminating in the payment of salesmen. A man is going to follow the line of least resistance and so will try to secure the business that comes easiest to himself without considering whether it is the most profitable for his company. Col. Street asked Mr. Kemble what he considered the best method of payment, whether by salary, by commission or by a combination of these. Mr. Kemble, replying, thought the ideal method is the payment of a fixed salary and to put a man on his honor to work for the best interests of his company. He thought the straight commission payment a very dangerous one. The mixed method of paying salesmen is being tried by a number of United States companies, but the fact that they are modifying their system from time to time indicates that they have not reached a satisfactory solution of the problem. A fixed salary with bonus, if work is satisfactory, works well. Mr. Martin spoke on the value of co-operation between the engineering and the sales departments; he believed the business getter did not receive full co-operation from the engineer. Mr. Kemble rather took issue with Mr. Martin believing that the salesman having no knowledge of the engineering end of the business did not understand the difficulties in the way of making rapid installations. He believed that much good might come from the salesman acquiring such information as would enable him to place the requirements for any particular installation in the hands of the engineering department. That would prevent a great deal of delay and probably save the engineering department a visit to the customer. Mr. Marston spoke on the necessity of instilling in the mind of the salesman the fact that the load must be levelled up. The sales agent must not turn in the business which is easiest to obtain, he must work to make the load curve as nearly a straight line as possible. Mr. Kelly explained the system used in Hamilton where they pay a salary and also commission; the commission varying with the class of service.

The Incandescent Lamp and Its Circuit

By Ralph Beman, Engineering Department National Electric Lamp Association

This paper dealt with the limitations of the modern incandescent lamp, with special reference to the tungsten. It pointed out that incandescent lamps, with the exception of the tantalum lamp, operated equally well on alternating or direct current. The limitations of the tungsten are not such as to cause trouble on the ordinary circuit, though too small a filament renders them fragile, and too low a frequency with a small filament causes, in certain cases, a disagreeable flicker. The fragility of the tungsten filament which formerly caused trouble at the higher voltages is now overcome by using low voltage lamps. Even this is necessary only when small candle powers are required.

The paper dealt more fully with the flicker caused by a low frequency current. The extent to which the candle power varies during a cycle depends chiefly on four things. (1) The heat capacity of the filament. (2) The frequency of the current. (3) The temperature resistance co-efficient of the filament. (4) The emissivity characteristics of the filament. From (1) it follows that the size of the filament has much to do with the flicker, since the smaller the filament the smaller the heat capacity. A frequency of 25 and under only, causes disagreeable effects. At these low frequencies the filament has time to cool down appreciably between pulses.

The noticeableness of the flicker depends on various factors, including the brightness of the surface illuminated, and the personal equation of the observer. If the illumination is high, (say) 10 foot candles, such as may exist in a shop window, a smaller variation in the light will be detectable. In such a case a 40-watt tungsten may show objectionable flicker. Where the illumination is not so intense the flicker is not noticeable, and a 25-watt or even smaller lamp may be used on 25 cycles, without noticeable effect.

The effect of this changeableness in temperature which accompanies the flicker, on the life of the lamp, was noted. The life varies inversely as the candle power, to a power ranging from about 3.5 to 4 for different classes of lamps. If the candle power varies 30 per cent. above and below normal, during the cycle, which is about what happens with a 25-watt 120-volt lamp at 25 cycles, theoretically the life of the lamp would be reduced by about 20 per cent. For the same lamp at 60 cycles the life is reduced only 4 per cent. below what it would be at direct current.

The Importance of Co-operation Between Central Stations and Electrical Manufacturers

By C. F. Scott, Westinghouse Electric and Manufacturing Co.

This paper treated the subject of co-operation between the central station and the manufacturer of apparatus under the heads of engineering, commercial engineering and commercial. Under the first head it is advised that standard apparatus be purchased if it will meet the requirements, as such apparatus is the outcome of years of evolution in which the best thought of the designer, the best skill of the factory and the results of experience are combined. Conference with the manufacturer is recommended before decision as to a definite type or size of generating unit or other apparatus, thereby securing the advice of the manufacturer's engineering department, which is necessarily in touch with the changing conditions and with the operating requirements of other stations. While the wisdom of such conference is obvious, it is stated to be not uncommon for rigid specifications to be presented to manufacturers without provision for alternative propositions. As to commercial engineering, this in many cases consists in a definite adaptation of electrical appliances to bring commercial results. The knowledge of how to accomplish these results requires careful investigation, and experience which is often beyond the scope of the individual central station, and is something which must be undertaken by the manufacturing company, as it must know what are the exact conditions in order that it may design its apparatus to meet them.

The information and data which the progressive manufacturing company necessarily acquires in order to design its apparatus to meet requirements of actual service are the precise data that the central station needs in order to understand and effectively represent the situation to the power users whom it should serve. In commercial prosperity and success, as measured by the earning of dividends, the manufacturer and central station have much in common. The central station, in fairness to its patrons and for its own success, requires the best possible apparatus. The loss of direct revenue from a short interruption of service, not considering the loss of prestige and cost of repair, much more than compensates for the difference between the cost of the inferior apparatus and the cost of the best. The manufacturing companies have expended millions of dollars in developing new and better apparatus, and the central station is reaping the benefit. Such work must go on, and it must be aided both by engineering corporations and by the commercial encouragement of the central station interests. Upon the progressive policy of the central station in acting with the manufacturer of apparatus on the one hand and the public on the other depend the commercial prosperity of the manufacturer and the central station and the general welfare of the community, in which industries, transportation and daily life are becoming more dependent upon electric power.

Discussion on Mr. Scott's Paper

This paper was discussed at length by Mr. Black, Mr. Beman, Mr. Lambe, Mr. Kemble, Mr. Baker, and the president. Answering a question by Mr. Black as to the possibility of getting more coil wound induction instead of the squirrel cage rotors in this country, Mr. Scott replied that the simplicity of the squirrel cage must be considered. The motor should be so protected at its point of installation that any excess current will blow out at the motor itself and not at the central or substation. The idea brought out in the paper about co-operation between the manufacturer and the central station being of great value to both met with favor by all who discussed the question. It was the general opinion that the central station man should be encouraged to discuss his problems and difficulties with the manufacturer as the latter was likely to have the latest information and the most competent engineering staff obtainable. The question of standardization also came up for discussion and while admitting its value, it was argued in one or two cases that it was possible to carry standardization to excess, thus tending to withhold progress and retard the introduction of improvements. The other extreme is found in England where too little attention is paid to standardization. Emphasis was also laid on the necessity for good apparatus. It was too often found that the central station manager purchased a certain kind of supply because it could be obtained a few cents cheaper when in reality its shorter life or lower efficiency or greater cost of maintenance made it ever so much the dearer article.

Ornamental Street Lighting

By T. F. Kelly, Contract Agent, Hamilton Electric Light and Power Company

This paper reviewed the ornamental street lighting installations made throughout Canada up to the present time. The installations in New Westminster, Vancouver, St. Catharines, Hamilton, Fort William, and Ottawa, came in for some consideration. Toronto, Calgary, and some other towns were not described, as these are more recent installations and information was not available at the time the article was written.

The author believes that this system of street lighting is in advance of any other street lighting system used up to the present time. The majority of the standards have 5 lamps, though some have three and in Fort William ornamental combined trolley and lighting standards have been installed carrying 4 lamps giving good results, both as to low maintenance cost, and as to illumination.

The paper also points out that this system of lighting is likely to gain in popularity especially where the city streets are comparatively narrow, but suggests that for wide streets the magnetite arc lamps on ornamental iron poles will likely give better results. Such an installation will probably be put up in Winnipeg.

The plan of installation in the various cities was described, the dimensions of the standards, their distances apart, the number of lamps they carry, the size of the lamps, and so on. In some cases low voltage, high amperage lamps, either series or multiple, or series-multiple are used, such as 7.5 amp. and 8 volts. In other cities higher voltages up to 110 have given satisfaction. For example, Toronto uses 110 volt tungstens, 5 in series on a 550 volt distribution service. In all of these installations tungsten lamps are used, on account of their greater efficiency.

Mr. Kelly's paper concluded with a description of the method of obtaining business followed by his company in Hamilton. Hamilton has come to be known as one of the best lighted cities on the continent, and the author stated that the citizens appear to appreciate this latest move on the part of the company, almost more than any other attempt that had been made by them to advance the electrical interests of Hamilton.

Discussion on Mr. Kelly's Paper

Mr. Pack enquired as to the maintenance cost of his system, to which no very definite answer was vouchsafed owing to the short time these installations have been in operation. The lamp renewals would not exceed one a year and the globe renewals would be almost negligible. Mr. Lambe thought the system of ornamental lighting was not a correct one and that the proper scheme was to have two or three cross trolley poles carrying lights. The president, Mr. McNabb, Mr. Beman, Mr. Kemble, and Mr. MacLaughlan discussed conditions of business getting under this system. Mr. Black was in favor of cluster lighting and described a number of advantages this system possesses over others. Mr. Scott spoke of the different kind of lighting produced by the ornamental clusters. He expressed the opinion that our first impression that the illumination is not as good as that of arcs, for example, is that we have developed the habit of looking for intense spots of light. In Mr. Scott's opinion the distribution and general illuminating effect has been much improved. The effect on sign, window and decorative lighting was also discussed and the statement definitely made that since the advent of better street lighting there had been a decided increase in sign and window illumination. This seemed to be necessary to produce the required contrast desired by the merchant to draw attention to his place of business. Mr. Pratt spoke on the question of maintenance in Hamilton. They have tried various globes and at present use the opal globe which is less efficient but more ornamental and the people like it. In Hamilton they can afford to use the less efficient globe because they use 125 watt units.

Report of Committee on Standardization of Line Construction

The chairman of this committee, Mr. Black, did not present a written report and stated that the N. E. L. A. had a committee at work on this very topic which would be presented in the near future. Pending this report his committee had felt that further work would not be useful.

Some Recent Developments in Electric Heating and Cooking Devices

By Roderick J. Parke, Consulting Engineer, Toronto

Mr. Parke outlined in this paper the gradual evolution of electric heating and cooking devices. The paper explained that up to the present time the efficiency of the cookers has been very low which, coupled with the comparatively high price of electric current, has caused the electric device to compare unfavorably with gas. A table of rates had been calculated by Mr. Parke showing that gas at 50 cents per thousand cu. ft. was equivalent to electricity at 1.25c per kw.h.; gas at 70 cents (as in Toronto) to electricity at 1.75c and so on up to gas at $2.00 which is the equivalent of electricity at 4c. This with the condition of efficiency in the most modern electric cookers.

The paper then proceeded to describe a new stove recently invented by two young Canadians, which combined the three fundamental principles of electric heating, heat retention, and automatic control. The automatic control keeps the temperature "as desired" anywhere between 100° F. and 400° F. Comparative cooking tests where described between the operation of a gas oven, a non-automatic electric oven and this new automatic electric oven, in a number of operations as carried out in the ordinary kitchen. These results as to cost, in cents, of the preparation of equal weights of different articles of food are tabulated below, the cost of the gas being taken at 70 cents and electric current at 5 cents.

	Gas Oven	Non Automatic Elec. Oven	Automatic Elec. Oven
Bread	1.47	5.25	1.85
Roast Beef	2.45	5.6	2.1
Potatoes and Asparagus	1.70	4.4	1.5
Carrots	1.4	3.5	1.25
Sponge Cake	1.54	2.25	.55
Strawberry Pie	1.75	4.5	1.65

A test of the efficiency of the automatic electric oven showed it to be 79.31 per cent., a figure which the author believed had not been equalled by any other device up to the present time.

In his concluding paragraph Mr. Parke points out that with gas at 70c and current at 5c per kw. h. the electric oven can actually be made to operate more economically than gas. If the price of current can be reduced to 2.5 the saving over gas is 50 per cent. and it is suggested that central station men might find it to their advantage to cater to this class of load, to fill in their off-peak hours.

Importance of the Use of Potential Feeder Regulators, on Distributing Systems

By C. E. Allen, Westinghouse Electric & Manufacturing Co.

The value of potential feeder regulators to all central stations having more than one feeder line was emphasized in this paper. The development of the present regulator was outlined from the step by step type, operated by hand to the present automatic motor control type. The advantages of the modern automatic regulator were stated to be, (1) Absence of contacts. (2) The infinite number of voltage steps. (3) Accessibility to parts. (4) Simplicity of construction.

The author stated that objections had been raised to the noisy operation of the induction type, but that the later productions had entirely overcome this objection.

The construction and operation of the regulator was described at considerable length, and illustrated. The motor-operated regulator includes a limit switch, a brake and motor. The function of the limit switch is to open the motor circuit and supply the regulator when it has reached the position of maximum boost or buck. The brake magnet is connected in parallel with the motor circuit, and when the current is applied to the motor, the brake releases it, allowing the motor to revolve freely. When the motor circuit is opened the brake is applied instantaneously stopping the motor and preventing the regulator from overtravelling.

The automatic induction feeder regulator consists of the motor operated regulator with primary relay, secondary relay or contact making voltmeter, compensator, series transformer, and potential transformer. The primary relay is in series with the secondary of the line drop compensator and obtains its power from the voltage transformer connected across the feeder to be regulated. The function of the compensator is to introduce into this circuit percentages of ohmic and reactive drop in proportion to those of the feeder circuit, thereby giving a circuit of approximately the same relative characteristics as those of the feeder. The primary relay consists of a solenoid magnet which controls the armature supporting the contact. This relay controls the secondary relay which in turn controls the motor circuit. As a rule the regulator capacity is approximately 10 per cent. of that of the feeder which represents a regulator for 10 per cent. boost or buck.

Figures were given showing the influence of the regulator on the power factor of the circuit, the regulator having an efficiency of 94.7 per cent. and a power factor of 82 per cent. In a number of tests made, the decrease in power factor of the feeder circuit averages about 2 per cent.

The most desirable arrangement for the control of the voltage of a station is to have a generator voltage regulator on the generator, controlling the terminal voltage, and a feeder regulator for each feeder. This system is being used to-day, by many of the larger central stations.

The author calculated that the expense of installing a 10% regulator in a smaller central station would be returned to the company, in sundry savings, in approximately 2 years.

Discussion on Mr. Allen's Paper

In reply to Mr. Black's query as to whether the manufacturers could not produce a regulator at a lower cost than the automatic one described by Mr. Allen, Mr. Scott explained at length the intricate construction of these regulators and the necessity for great accuracy. Mr. McDunnough, Mr. Pratt, and the President also gave valuable suggestions.

Convention Notes

The central stations were again victors in the baseball match, scoring 12 runs, against 11 to the credit of the manufacturers.

Mr. B. E. Rowley, of the Pacific Electric Heating Company, Los Angeles, Cal., was present at a C. E. A. Convention for the first time, and expressed his satisfaction.

A souvenir distributed at the convention which was highly appreciated by the recipients was a first-class fountain pen, the gift of the Sunbeam Incandescent Lamp Company. It bore the inscription "Write your orders for Sunbeam lamps, Mazda, Tantalum, Carbon." Manager Irving and T. R. Price were always popular.

The winners in the aquatic sports were: Men's doubles—1st, W. H. Reynolds and A. V. Gale; 2nd, A. W. Joliffe and E. G. Garner. Ladies' singles—1st, Mrs. Morden; 2nd, Miss Neelands. Crab race—1st, W. H. Reynolds; 2nd, W. E. Joliffe. Mixed doubles—1st, Miss Neelands and Mr. Reynolds; 2nd, Mrs. Morden and Mr. Gale. Swimming race—1st, E. O. Bath; 2nd, Wm. McDonald. Tilting Contest—1st, S. B. Heath and S. Dion. Men's single—1st, A. V. Gale; 2nd, A. W. Joliffe.

Water Powers on the Winnipeg River

By E. A. Graham

The City of Winnipeg is particularly fortunate in having at her doors so great a power producer as the Winnipeg River, and it is also fortunate for the early development of the water powers of the river that there is so great a market within easy transmission distance. The value of the water power to Winnipeg and the surrounding country is still further enhanced by the high cost of coal and other fuel, and as the cost of power from the city's municipal plant at Point du Bois will be reduced as the debentures are retired until it reaches its estimated minimum of $12.50 per horse power per annum, there should be a great and growing demand for power for domestic purposes of heating and cooking, besides that for manufacturing and railway uses, so that Winnipeg will certainly be the Electric City of the Prairies.

The Winnipeg river has its source in the large group of lakes in Western Ontario, of which the Lake of the Woods, with its area of 1,200 square miles, is the largest. Nearly the whole of this district is a net work of lakes and swamps, and well forested. The river runs in a northwesterly direction for 150 miles and empties into Lake Winnipeg. One hundred miles of its course and 270 feet out of a total fall of 347 feet is in Manitoba. The English River also has its source in Ontario, and drains a well forested region abounding in lakes and which lies north of the Lake of the Woods district and comprises about 21,000 square miles. It joins the Winnipeg River near the boundary of the two provinces. The Winnipeg River has, therefore, the following sources of supply:—

	Square Miles
Winnipeg River, drainage area,	30,400
English River, drainage area	21,650
Total drainage area	52,050
Gross lake area	5,660
Lake of the Woods	1,200
	cu. ft. per sec.
Minimum discharge	16,000
Maximum discharge	55,000
Mean discharge	35,500

Average annual precipitation, 18 to 25 inches.

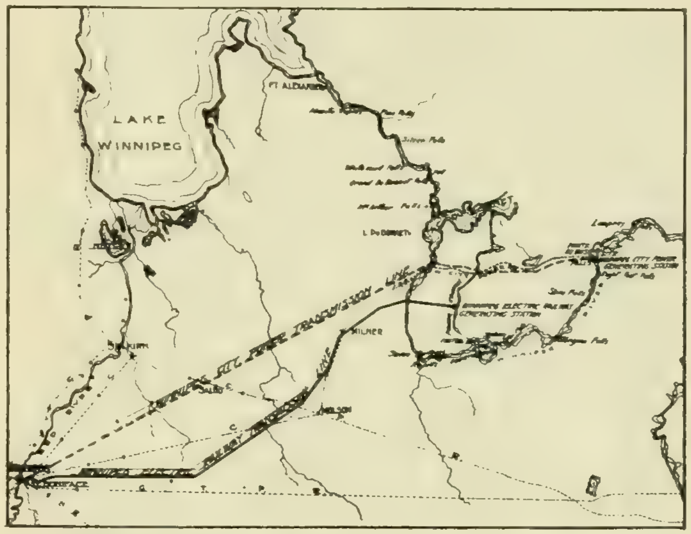
Assuming a mean annual precipitation of 23 inches for the lake region, it is found that the ratio of run off to fall is about 37 per cent.

Readings taken at the city's gauging station and by Mr. D. A. Ross at the Winnipeg Electric Company's gauging station show a minimum of flow during the winter of 1910 of 13,000 cubic feet per second. Observations of the Lake of the Woods level at Kenora have shown it to have fallen steadily the past two years until it is now almost five feet below the normal level.

This fall is believed to be due to the dry weather of the past two years, and it will be some time before the water level is back to its normal height. The dams of the power houses at Kenora assist to a large extent in equalizing the discharge at this point and with some improvements and additions will be of still greater assistance in controlling the flow in the river below.

Observations of very old flood marks along the river indicate a maximum discharge of 90,000 to 100,000 second feet, but 55,000 second feet is the highest recorded. Since practically all of the water comes from the group of lakes above noted, and is comparatively easy of control, the minimum flow of the river could be raised considerably and so regulated as to be practically uniform. Even as it stands at present the Winnipeg River has about the most uniform flow of any undeveloped river in America, the ratio of minimum flow to maximum being 29 per cent., while that of the Ottawa, a river having very similar drainage basin and minimum flow, and being typical of more settled districts, is about 7 per cent.

The river runs through a thickly wooded country typical of the Laurentian formation, and the solid granite so near the surface of the ground offers many advantages for solid hydraulic construction, and the natural configuration of the river provides a number of very good power development sites where the amount of hydraulic work necessary is very low, considering the amount of water to be handled at the low heads.



Map Showing Part of Winnipeg River

The following falls are found along the river between its junction with the English River and the lake:—

	Feet
Lamprey Falls	12.25
Point du Bois	32.
Eight Foot Falls	8.0
Slave Falls	17.50
Sturgeon Falls	4.30
Otter Falls	1.10
Seven Portages Rapids	23.30
McArthur Falls	7.00
McArthur Falls No. 2	7.00
Grand Bonnet Falls	34.00
Little Bonnet Falls	8.00
White Mud Falls	12.15
Silver Falls	22.72
Pine Falls	7.75

Of the above, at least four sites can be profitably used for power development by drowning out smaller falls. These are Point du Bois, 45 feet; Slave Falls, 25 feet; Grand Bonnet, 48 feet., and Silver Falls, 45 feet. A portion of the discharge is available at Seven Portage Rapids under 30 feet head, and the Winnipeg Electric Railway Company is now developing power on the Pinawa or east branch of the river. There is therefore available a total of about 375,000 horse power at the known minimum flow of the

river, under present conditions of flood control. The city of Winnipeg has almost completed a development at Point du Bois, which will ultimately supply 60,000 horse power, of which about 26,000 horse power will be generated at present.

All of the water powers are under the control of the Department of the Interior, and application for development must be made to this department. The city of Winnipeg holds a perpetual lease of the Point du Bois site subject to continuous beneficial use, and to control by the Governor General in Council of rates to be charged consumers, and to a rental for the use of the water.

The Manitoba Power Company has acquired the right in the Grand Bonnet or Great Falls, held by Mr. R. R. Muir, and propose to develop them under the following agreement with the Department of the Interior: (1) Development operations must commence during 1911, according to final plans which are to be submitted for the Minister's approval (2) $100,000 must be spent on actual development operations by November 10 in each year during 1911 and 1912. (3) A minimum of 5,000 horse power must be developed and ready for use by November 10, 1913. (4) All development operations must be made under the direct supervision of a qualified inspector appointed by the department, and according to plans and specifications to be approved by the department. When these conditions are complied with it is necessary to secure a lease for the necessary land, and a license for the diversion and use of the water, both lease and license to be good for twenty-one years, and renewable for three further periods of two years each, subject to cancellation at any of these periods if necessary in the public interest upon one year's notice being given by the Minister of the Interior, compensation to be allowed for the actual plant only and to be determined by arbitration.

Both the public and the investor have been well and justly looked after by the department of the interior in the regulations for the use of this public asset. Applications are in for the development of the principal water powers of the river, and it is only a question of a comparatively short time when these will be supplying a large amount of power to Winnipeg and the surrounding country.

To the tourist and sightseer, the Winnipeg River is also of great interest, on account of its beauty and the wildness of the country which is not often found near to so large a city as Winnipeg. There is plenty of sport for the hunter and fisherman, as moose are plentiful, and there are bear and deer, and any amount of ducks in season. Trout and pickerel and other fish abound, and furnish plenty of sport. At present the river can be reached at the head at Kenora, and by rail to Lac du Bonnet, from whence the city of Winnipeg have a tramway line to Point du Bois. There are other lines proposed from Lac du Bonnet down the river to Lake Winnipeg so that as the river becomes more accessible it should become a great summer resort.

Acknowledgements are due recent reports of Messrs. W. G. Chace, C. E., and W. Thibaudeau, C. E., for certain information contained in this article.

Progress for June on Winnipeg's Municipal Plant

The following extracts are taken from the June monthly report of Smith, Kerry & Chace: Gunn & Son have made good progress with the construction of the power house at Point du Bois; the Jens Orten-Boving Company have about completed the assembly of turbines 1, 2 and 3 and are well advanced with number 4; they are also setting governors for the easterly units. Messrs. Vickers Sons & Maxim have started the assembly of generators Nos. 1 and 2; generator 3 has been shipped. The Canadian Westinghouse have made good progress setting switch bars, installing switches, and running cables and bus-bars. Canadian General Electric Company have made steady progress in wiring the station. The Canada Foundry Company have delivered the gate stems and operating mechanism, also air compressor and sundry other material and are proceeding with erection

Fair progress has been made by Claydon Bros. at the terminal station. The Canadian Westinghouse have been working in the high tension switch room, and Chapman & Walker have been installing auxiliary apparatus.

In sub-station No. 2 the Canadian Westinghouse have had a few men working during the month and have been testing their equipment. In sub-station No. 1 practically all the steel work has been erected. The Canadian British Insulated Company have drawn into the conduit a total of 31,600 feet of 12,000 volt cable.

About 175,000 feet of conduit have been received from the H. B. Camp Company to date. Mr. G. M. Gest has made good progress in laying the conduit. According to more recent plans the dimensions of the manhole on the principal feeder runs have been enlarged and are being built of brick throughout. The service boxes are also being built of brick.

Winnipeg Street Lighting

City Electrician Cambridge has submitted the following report re street lighting, in the city of Winnipeg:—

"Herewith please find statement of cost of operating street lighting system for the fiscal year 1910-1911: It will, I believe, be gratifying to the committee to learn that the cost shown is the lowest reached since the franchise was taken over. The department's chief aim has been the furnishing of a satisfactory service, coupled with efficiency. The results reached have been largely due to the fact that the city council has given me a very free hand in the management of the work which has enabled the same to be run on a purely business basis. To this fact, coupled with the low cost of power, may be attributed the results shown."

Estimated cost street lighting, 1910-1911 ...... $54,799.93
Actual cost street lighting, 1910-1911 .... 43,221.59

Cost per lamp per year (1910-1911)—Midnight schedule, $31.70; moonlight schedule, $40.50; all-night schedule, $43.43.

Current Notes

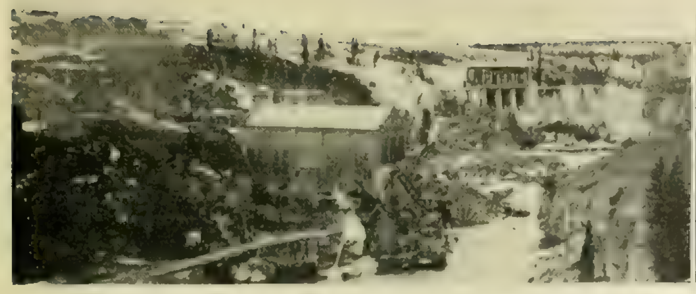
The Winnipeg city council has awarded the contract for 150 ornamental street lighting poles to Dunn Bros., of Winnipeg, for $15,612.50, with an allowance of $6 extra per pole for a different form of bracket and for fitting the poles with a special arm to carry lamps of the police and fire alarm signal system.

The control of the street lighting has been transferred from City Electrician Cambridge to Power Manager Rossman. Mr. Cambridge will have supervision over the inspection of interior and exterior wiring in the city, and over the police and fire alarm signal systems.

The installation of the underground conduit system by the G. M. Gest Company is proceeding rapidly, with Mr. H. J. Hawkshaw in charge of the work. A 60-duct run is laid out of King street sub-station, 28 ducts going down King street, 28 down Notre Dame, and 24 down McDermott.

Mr. Matthews Moves Up

Mr. H. G. Matthews, secretary-treasurer and general manager of the Marconi Wireless Telegraph Company of Canada, Limited, at Montreal, has accepted the position of assistant to the president of the Quebec Railway, Light, Heat & Power Company, Mr. Rodolphe Forget, M.P. Mr. Matthews assumes his new duties at Quebec on August 1. He has been with the Marconi Company for eight years. Previously Mr. Matthews was engaged in financial business.




Two Views Head Gates and Power House, Horseshoe Falls, Bow River Calgary Power Company

Calgary Power Company's Plant, Bow River

A Description of the Apparatus and Transmission Lines—Fifty-Five Miles to Calgary at 55,000 Volts—Ultimate Capacity 20,000 h.p.

The following is a short description of the plant of the Calgary Power Company, which is now supplying the City of Calgary with electric power.

The generating station is situated at Horseshoe Falls on the Bow River, about 50 miles west of Calgary. Current is generated at this point at 12,000 volts, 3-phase, 60 cycles, and part transmitted at this voltage to Exshaw, 8 miles distant, and part stepped up to 55,000 volts for transmission to Calgary. The accompanying photographs illustrate the location of the plant and the various phases of the construction work.

A concrete dam has been built across the river just above the falls. This dam is provided with an ice runway, four hydraulically operated sluice gates, and stop-log and flashboard spillways. The water, after passing through the screens is carried by means of steel penstocks down to the turbines in the power house and discharged into the river below the lower falls, giving a total head of 70 feet.

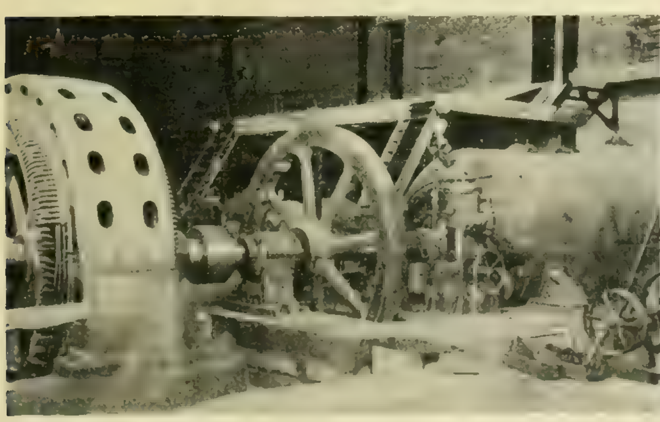
The initial installation consists of two 3,750 h.p. turbines direct connected to two horizontal shaft generators of 2,500 kv.a. capacity at 3-phase, 60 cycles, 12,000 volts, at 300 r.p.m. There are also two 330 h.p. turbines direct connected to two horizontal shaft 175 kw., 125 volt, 700 r.p.m. exciters. The turbines were manufactured and installed by the Jens Orten-Boving Company, while the generators and exciters were furnished by the Canadian General Electric Company.

Current is carried from the generators to either of two sets of bus bars, one set supplying the two 12,000 volt outgoing lines to Exshaw and the other set supplying the step-up transformers which change the voltage to 55,000 volts for the transmission to Calgary. The transmission lines are of aluminum cable supported on pin type insulators on wooden poles. The Exshaw line is a double circuit line eight miles long. At present there is but a single line to Calgary but preparations are being made to build a second line. An overhead ground wire is run on each pole line. A private telephone circuit is carried on the same poles as the power wires.

The transforming station at the power house contains three 3,000 kv.a. oil insulated, water cooled, three-phase transformers. Space is provided for a fourth unit which will be installed when the generator equipment is completed.

The sub-station at Exshaw contains four 700 kv.a., oil insulated, water cooled, three-phase transformers, which step the voltage down from 12,000 volts to 600 volts to supply a cement mill close at hand. These transformers were installed by the General Electric Company of Sweden. The switching equipment in this station is hand-operated and was installed by the Canadian General Electric Company.

The terminal station in Calgary steps the voltage down to 12,000, 2,400, and 600 volts for distribution to the city



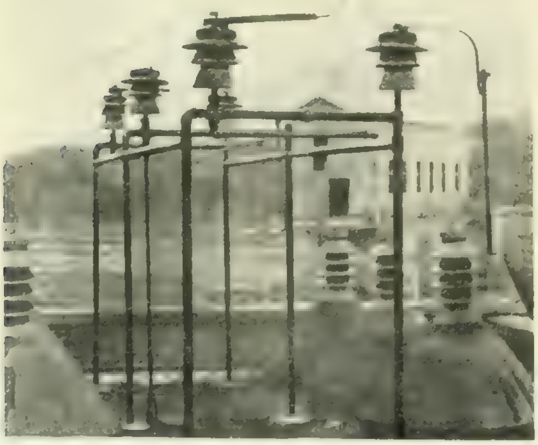

Showing one Generator Unit and Pipe Line, During Construction Calgary Power Company

of Calgary and to the Canada Cement Company. There are at present installed in this station two 3,000 kv.a. and two 1,250 kv.a. oil insulated, water cooled, three-phase transformers, with the necessary switching equipment for supplying power at the three voltages. Space is provided in the building for two additional 3,000 kv.a. transformers and additional switching equipment.

This plant went into operation early in May last and is now delivering power to the Canada Cement Company

Exshaw Sub-Station—Calgary Power Company

at Calgary, who expect to use a total of 1,500 h.p., and also to the city of Calgary, who are under contract for a minimum of 2,000 h.p. Immediate extensions are being made to the plant. A third turbine of 6,000 h.p. capacity, manufactured by the Wellman-Seaver-Morgan Company, has just been installed. This will be connected to a horizontal shaft generator of 4,000 kv.a. capacity at 60 cycles, 3-phase,



High Tension Outlets Calgary Power Company

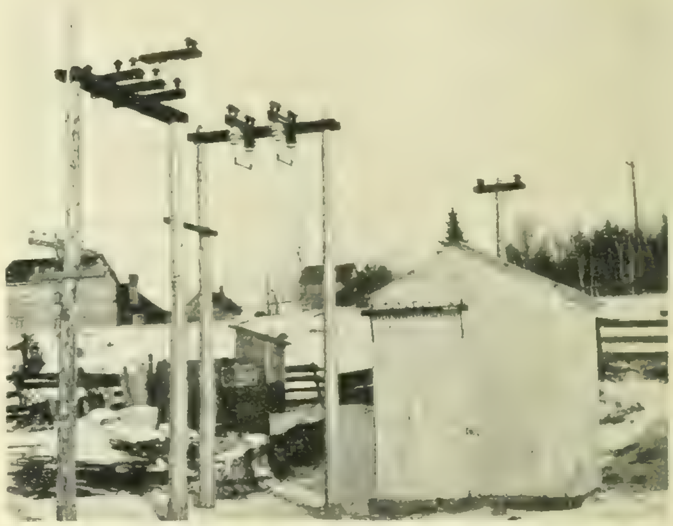
12,000 volts, 225 r.p.m, which is now being erected. Space is provided in the power house for a fourth similar unit.

The switching equipment at the power house is remote controlled, electrically operated from a control desk located on a gallery overlooking the generator room. Westinghouse type C oil switches mounted in concrete compartments are installed on the 12,000 volt circuits, while Westinghouse type GA oil switches are provided for the 55,000 volt transmission line. Two Tirrill regulators, with line drop compensators, are provided to regulate the voltage at Calgary and at Exshaw. The switching equipment at the terminal station is also remote controlled, electrically operated from a control board. Westinghouse type E oil switches in concrete compartments are installed on the 600, 2,400 and 12,000 volt circuits. Electrolytic lightning arresters and air type choke coils are in use on the transmission lines in all the stations.

The transformers and switching equipment in the power house and terminal station were manufactured and installed by the Canadian Westinghouse Company. The engineering firm of Smith, Kerry & Chace, Toronto, designed and have charge of the construction of this plant.

Callander Sub-Station of Nipissing Power Co. An Inexpensive, Fireproof, Quickly Erected and Efficient Structure

An interesting installation showing how a small load can be taken care of satisfactorily from a high voltage line at a reasonable cost, is illustrated by the photographs accompanying this item. The Nipissing Power Company's 22,000-volt line from the power house on the South River to North Bay, a total distance of about 20 miles, passes through the Village of Callander, which is about 9 miles



An Efficient and Inexpensive Sub-Station

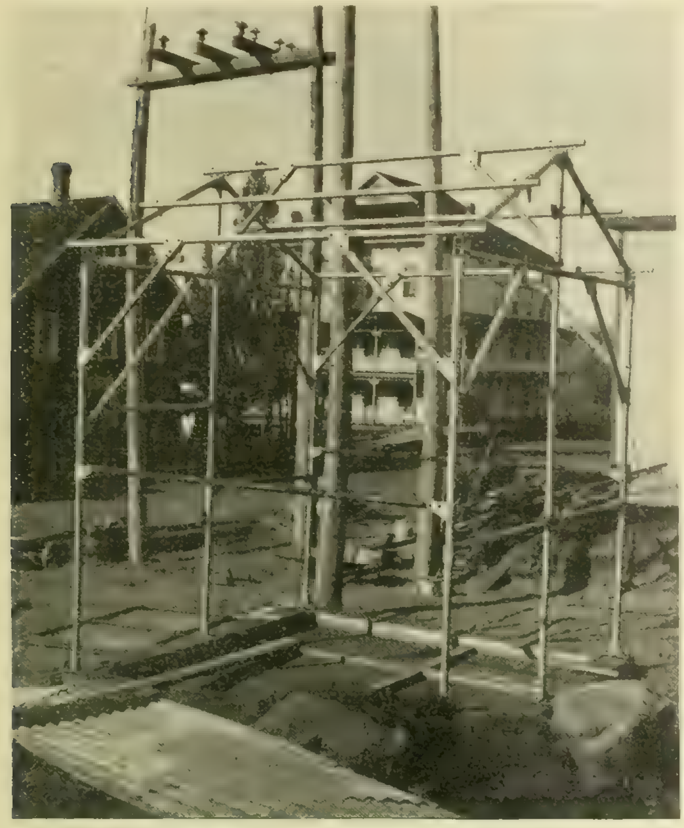
from North Bay. Callander in itself is hardly large enough to support an independent electric light and power company, but can be easily taken care of from the inexpensive substation shown, which is operated without any regular attendant, only requiring the periodical visits of the transmission line patrolman.

Except for the concrete floor, the substation building was erected complete in Toronto and consists of a galvanized iron pipe frame sheeted with corrugated galvanized iron. This gives a fireproof building at a comparatively low cost. The cost of the pipe frame work and corrugated iron sheeting complete f.o.b. Toronto was under $250. The building is 13 ft. square. No heating is necessary.

The equipment in the sub-station consists of one 50 kv.a. single phase transformer stepping down from 22,000 to 2200 volts. The control of this transformer on the high tension side consists of two downward pull out-door type, disconnecting switches mounted on a pair of poles outside the station and one pair of fused air brake switches inside the station and one pair of fused air break switches inside the station. Except for a pair of choke-coils no lightning arrester equipment has been installed on the high tension side of the transformers. However, the 22000 volt trans-

mission line throughout its entire length is protected by means of ¼-in. 7-strand galvanized steel cable, grounded at frequent intervals.

Operation of this substation for the past 6 months, which has included both severe winter weather and severe



Metal Framework of Callander Sub-station

lightning storms, indicates thus far that the lightning protection has been satisfactory.

At present the connected load on this station consists of about 400 lamps for commercial and residence lighting and fifteen 100 watt street lights. 24 hour service is given for the commercial lighting. The substation is large enough that, should a demand for three phase power arise, two additional transformers could be installed and the system changed over to three phase.

Messrs. Smith, Kerry, & Chace, as engineers for the Nipissing Power Company, designed and constructed the Callander sub-station and local distribution.

Sons of Jove at Convention

The bulletin announced that the climax of the convention would be the rejuvenation of the Sons of Jove on Friday evening. Jovian Statesman Geo. Rough had the assistance of several Buffalo members, and the initiation, always interesting, was put on with more than usual thoroughness. Included in the class of new members were several gentlemen prominent in the electrical industry, who, at the banquet which followed the initation ceremonies, strongly endorsed the objects of the society, as set forth in the slogan, "All together, all the time, for everything electrical."

Interesting exhibits of electrical apparatus were made at the Niagara Falls convention by the E. A. Greene Company, the Automatic Cook Company and the Pacific Electric Heating Company.

Personal Mention

Mr. W. C. Freeman has been appointed manager of the Ontario branch of the Stromberg-Carlson Telephone Company with offices at 72 Victoria street, Toronto.

Mr. William E. Marvin has been appointed Toronto representative of the Masco Company, Limited, and will have charge of all trade in the city of Toronto.

Mr. C. F. Scott, electrical engineer, of the Westinghouse Electric & Manufacturing Company, Pittsburg, has been appointed professor of electrical engineering at Yale University.

Mr. Henry B. Trottier has been appointed representative of the Masco Company, Limited, for the province of Quebec and the city of Ottawa, with headquarters at No. 1411A Pappineau avenue, Montreal, P.Q.

Mr. George C. Knott, who for the past six years has been connected with the Benjamin Electric Manufacturing Company, in New York and Chicago, is now located in Toronto, in charge of their Canadian factory.

Mr. C. W. Stokes has just returned from a trip to the various works of the Siemens concern in England and other European countries where he has visited a number of electrical equipments of power stations, collieries, mines, rolling mills, etc., carried out by the Siemens Company. He will now be located in Winnipeg, in charge of the branch of Siemens Bros. Dynamo Works Limited.

Mr. George J. Beattie, for some years Canadian representative of the Stromberg-Carlson Telephone Company, has resigned his active connection with that company to devote his full time to electrical contracting. For a number of years Mr. Beattie has owned an electrical contracting business which has been managed by Mr. H. Holmes, as superintendent, and which has now grown to such proportions that it requires his full attention. It is understood, however, that Mr. Beattie will remain connected with the Canadian telephone interests in that he will act in an advisory capacity for the Stromberg-Carlson Company.

Mr. C. L. Glasgow has been appointed Montreal district sales manager of Allis-Chalmers-Bullock, Limited. Mr. Glasgow has had extensive experience in the construction of electric railways and the design of electric power plants. After graduation he was in the employ of the well-known engineering and contracting firm, Westinghouse, Church, Kerr & Company, for five years, and was one of the engineers in connection with the construction of the Lackawanna and Wyoming Valley Electric Railway and the electrification of the Long Island Railway. Later he was engaged in the electrification of the West Jersey and Sea Shore Railway and also with the Northern Colorado Power Company. Mr. Glasgow is a graduate of Cornell University in mechanical engineering.

Mr. A. J. Soper has severed his connection with the engineering firm of Smith, Kerry & Chace, to enter the sales department of the Wire & Cable Company, of Montreal. Mr. Soper, for a young man, brings to his new work the advantages of an unusually wide and varied experience. Before entering McGill he spent three years on testing, laboratory and engineering work with the General Electric Company at Schnectady, N.Y. His first two summer vacations were also spent with this company. His third summer he spent with the Electrical Development Company at Niagara

Falls, and graduated, in 1909, with honors in electrical engineering. Since graduation he has been with Messrs. Smith, Kerry & Chace, with headquarters in Toronto, where he has had charge of much responsible work in connection with high tension transmission and distribution and electric railway work. Among the engineering profession Mr. Soper is also favorably known as the author of an original paper on "Transmission Line Characteristics and Calculations," presented before the Toronto branch of the A.I.E.E., and by an article in the Electrical News describing a "New Method of Calculating the Regulation of Transmission Circuits," both of which were considered valuable contributions to the literature on this important problem.

Mr. Patrick Dubee, the new vice-president of the Canadian Street Railway Association, was born in Montreal in 1876. He entered the employ of the Montreal Street Railway Company as a mere lad, but worked his way up to assistant secretary in 1900 and secretary in 1903. He is now secretary of the Montreal Street Railway, the Montreal Park & Island Railway and the Public Service Corporation —the three organizations for which authorization to amalgamate was recently secured from the Quebec Legislature. Mr. Dubee is also a director and the secretary-treasurer of the Montreal Street Railway Mutual Benefit Association. He has been on the executive committee of the C. S. R. A. ever since the formation of the association in Montreal in 1905.

Mr. Patrick Dubee

Engineers Dissolve Partnership

The firm of Ross & Holgate, consulting engineers, was dissolved on the first of July. Messrs. R. A. Ross and Henry Holgate have been in partnership for ten years as civil and electrical consulting engineers. They have had to do with many important undertakings in various parts of the Dominion and have built up for themselves a reputation that any professional firm might well strive for. Mr. Ross will continue business in the office at No. 80 St. Francois Xavier Street, while Mr. Holgate has secured a suite of offices in the Richelieu & Ontario Navigation Company's building, No. 9 Victoria Square, where he will occupy an entire floor. Each will continue the practice of his profession as usual.

The Lighting of the New Grand Trunk Pacific Car "Australia"

The electric lighting system on the car "Australia," which has recently been put into service on the Grand Trunk Pacific Railway, may well be said to be a work of art as regards the general illumination and finish of the numerous electric fixtures placed throughout. The equipment is controlled from a switchboard placed in one of the passages and consists of two main five-point and one two-way switches; also by independent switches in the various state-rooms and lavatories.

The power is supplied by a low voltage belt-driven dynamo suspended by one corner of its frame from the body of the car, with two sets of batteries working in parallel, one on either side. There are 98 electric lights in all, made up of 9 combination gas and electric, 50 berth or reading lamps, and 12 single pendant lamps. In the upper deck there are 9 combination centre lamps, each having four 16 c.p. metallic filament bulbs and one gas mantle, the whole enclosed in a beautiful embossed glass bowl giving the light a very rich soft tone. Five of these handsome fixtures supply the main body of the car with light, while on either side there are 20 berth lights, provided with prismatic lenses which throw the light where it is mostly needed. These are controlled by switches conveniently placed at the bottom of the fixtures.

There is also an electric oscillating fan at each end of the room. The drawing room is lighted by one combination gas and electric centre lamp and six berth lights, while the ladies' stateroom, adjoining, has one combination and four berth lights. The gentlemen's end is equally well lighted with combination centre lamps and single pendants. The various lavatories, passage ways and platforms have eight single electric pendants and nine gas lamps. This makes up a total of 1,072 c.p. The installation was carried out at the Grand Trunk Railway Point St. Charles shops, Montreal.

New Books

Whittaker's Arithmetic of Electrical Engineering,—designed specially for students and engineers, second edition, revised, published by Whittaker & Company, London and New York, price 1 shilling net. A small book on the arithmetic of electrical engineering, containing 72 worked examples and 300 exercises. It is specially prepared as a companion volume to the numerous works on electrical engineering published by the same firm in the hope that it may prove an aid to the student who desires to acquire the ability to calculate quickly and correctly.

Ventilation of Electrical Machinery,—by W. H. F. Murdock, B.Sc., M.I.E.E. Whittaker & Company, publishers, price 3 shillings net. The book is intended as an introduction to the problem of ventilation applied to electrical machinery. The author states that there appears to be, in certain quarters, an extraordinary aversion to artificial cooling devices which seems to arise through an entire misconception regarding these. It is believed that this book will tend to dissipate some of these ideas.

Whittaker's Electrical Engineer's Pocket Book.—By Kenelm Edgcumbe; Whittaker & Company, London, E.C., publishers; price 5s. net; a third edition revised and enlarged. The general arrangement as used in the first two editions has been retained but a very large part of the whole has been entirely rewritten, so as to bring it thoroughly up to date.

Electric Railways

Shunting vs. Bridging in the Series Parallel Control of Railway Motors

By Clarence Renshaw

In the development of apparatus for the series parallel control of railway motors, one of the first problems which presented itself was how to effect the change to parallel after the motors had been brought up to full speed in series with all of the resistance cut out. The obvious method, of course, is to shut off the power, change the connections and then start up again. With this arrangement, the car, of course, loses some headway while the circuit is open. The inertia of the car itself and of the rotating armatures, however, tends to prevent any great slackening of the speed, and, if the resistance is properly proportioned and the controller handled with reasonable care, very satisfactory results are obtained.

Where very rapid acceleration is employed, the momentary slackening of the car or train in passing from series to parallel can usually be detected by one who is watching for it, although, as a rule, no more readily than can the passage from one resistance notch to the next. On account of its use in the L-4 and other similar controllers, this arrangement is frequently referred to as the L type connection.

The complete shutting-off of power from the car while changing the motors from series to parallel is, however, not at all necessary. If two motors are running in series, it will readily be seen that one of them can be completely short-circuited if the proper resistance is simultaneously inserted in the circuit of the second. Not only can the current through the motor which is left in circuit be maintained at its same value, but by suitably proportioning the resistance inserted, it can be regulated to any desired value. After the short-circuit has been placed around the first motor, it may then be disconnected from the circuit of the other motor and finally connected in parallel, instead of in series, with it. In this way, therefore, the change can be made from series to parallel by opening the circuit of only one-half of the motors, instead of all of them, and the load on

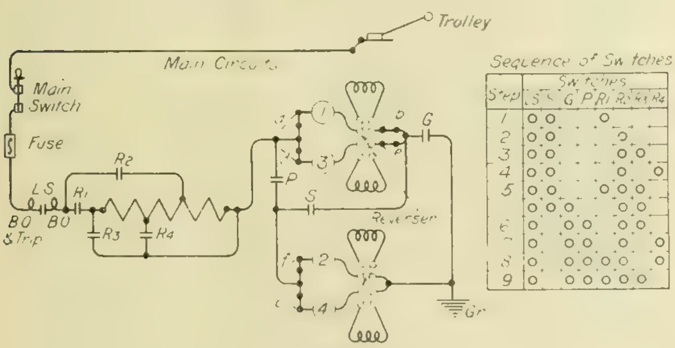


Fig. 1

the other half may be increased sufficiently, during the brief period required for the change, to partially maintain the acceleration of the car. This arrangement has been very widely used for many years in nearly all of the well-known K type controllers, and on this account it is usually referred to as the K type connection, although it is sometimes called shunting.

By referring to Fig. 1, which shows a schematic diagram for a typical Westinghouse type HL control equipment, the details of the K type arrangement may be more readily understood. With the controller on the fifth notch, which is the full series position, the current comes from the trolley through switches LS, R1 and R3, then divides through Nos. 1 and 3 motors, next goes through switch S and finally divides through Nos. 2 and 4 motors to ground. When the controller handle is moved toward the sixth notch, switch R1 first drops out. Current then enters through switch R2, part of it going to the motors through one section of the resistance and the remainder through the other section and through switch R3, after which its path is as before. The result, therefore, has been to insert resistance in the circuit. As the handle is moved further, switch G next closes. This allows the current to go direct to ground, after dividing through Nos. 1 and 3 motors, without passing through Nos. 2 and 4; that is, this short-circuits Nos. 2 and 4 motors. As the handle is moved still further,

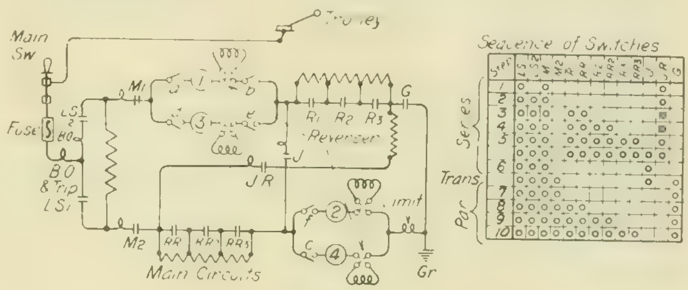


Fig. 2

switch S then opens cutting off Nos. 2 and 4 motors from the series connection and switch P closes, connecting them in parallel with Nos. 1 and 3. The change to parallel is then complete. It will thus be seen that this sequence of changes (which, although requiring many words to describe, takes place in a small fraction of a second) maintains a current, whose value depends on the design of the resistance, through Nos. 1 and 3 motors during the entire time and thus maintains the speed of the car, instead of allowing it to fall off, as with the L type connection.

The shutting-off of power from even one-half of the motors while changing from series to parallel, can be avoided and current maintained in all of them, if desired, by the use of the somewhat more complicated arrangement of circuits shown in Fig. 2. With this arrangement, in the series position, current flows from the trolley through switches LS2 and M1, divides through Nos. 1 and 3 motors, passes through switch J, and then divides through Nos. 2 and 4 motors to ground. In changing to parallel, switches M2 and G are first closed, giving a second path for current from the trolley through the switches LS1 and M2 through the first set of resistance, through switch J in opposite direction to the motor current, through the second set of resistance and finally through switch G to ground. Switch J is then opened, leaving the motors connected in parallel instead of in series, and with the first set of resistance in circuit with Nos. 2 and 4, and the second set in circuit with Nos. 1 and 3. It will thus be seen that the change has been made without interrupting the current to any of the motors. This arrangement is called the "bridging connection." It was first put out with the automatic type of unit switch control and more recently it is used in some of the later types of controllers such as K-34, K-35, etc.

Comparing the three general schemes of changing from series to parallel, the obvious advantage of the K type over the L type are obtained with no additional switches and no added complication of circuits, so that the perfection of the former method leaves no logical reason for any further use

of the latter. The much less important advantages of the bridging connection over the K type, however, can be obtained only at the cost of a considerable number of additional switches to give the same number of controller notches as well as greater complication of the circuits. For instance, to obtain the same number of notches with the bridging connections as were obtained in Fig. 1 with eight switches, there would be required the thirteen switches shown in Fig. 2. On this account, simplicity being so essential an element in all matters relating to railway equipments, the bridging connection cannot be regarded as superseding the K type, but merely as a refinement for application in certain particular cases. Theoretically, the bridging connection gives smoother acceleration, but practically, the K type with a properly proportioned resistance, leaves so little to be desired in this respect that it is impossible to tell by riding on a car which form of control is employed.

For controlling large motors operated from a power system with close regulation and large capacity, the ability to maintain the load on all motors throughout the accelerating period, together with the inherent possibilities of better acceleration, makes the bridging connection preferable. Where automatic acceleration is employed also, it is somewhat easier to provide a system of interlocks to produce the particular sequence of switches required for the bridging connection than it is for the K type. For this reason, automatic unit switch control equipments, since they are usually employed with powerful motors on large third-rail systems, are, except in the very smallest sizes, designed with the bridging connection.

Gas-Electric Motor Cars*

By W. B. Potter, Chief Engineer Railway and Traction Department, General Electric Company

The electric car meets certain transportation conditions where steam operation would be both unsatisfactory and uneconomical, and there are other conditions which, in the present state of the art, are undoubtedly better met by the steam locomotive. There are intermediate conditions where self-propelled cars are less expensive to operate than steam trains and where the investment for such cars would be considerably less than for complete electrification. In this latter class are many branch lines of steam roads and projected developments of new roads which might not at first justify electrical equipment. Recognizing this situation, efforts have been made to drive such a car with a self-contained boiler and engine, but without great success, as the performance is limited by restrictions imposed on the boiler capacity.

The development of the gasoline engine and its application to this class of work have resulted in marked success. The gasoline engine as a prime mover is essentially different from a steam engine in that it has no variable effective pressure in the cylinders such as may be secured by the variable cut-off of a steam engine. To secure the tractive force required for starting and to meet the changing requirements of speed and grade, it is necessary that some form of variable gear reduction be introduced between the engine and the driving wheels. To utilize the power of the gas engine to the best advantage it is essential to have a wide range of gearing. To a limited extent this can be secured by mechanical drives, with different sets of gears, as commonly used in automobiles. But the mechanical drive cannot, within practical limits, be provided with the desirable number of gear changes, and it also subjects the engines and driving mechanism to a severe strain by reason of the mechanical shock resulting from the use of a clutch.

*Abstract of a paper read at the annual meeting of the Street Railway Association of the State of New York, Cooperstown, June 27-28, 1911.

The electric drive may seem a refinement, but its advantage will be appreciated when it is recognized that the engine may be driven at its most advantageous speed, independent of the speed of the car, and that the tractive force, without changing the speed of the engine, may be varied from what is required to accelerate the car to that required to drive it at 60 m.p.h. This change in tractive force and speed is accomplished smoothly, and without shock to the mechanism throughout the entire range. As an illustration, the electric drive makes it possible to develop a tractive force of 10,000 lb. at 1 m.p.h. and, without manipulating anything other than the electric controller, to propel the car at 60 m.p.h.

The gas-electric equipment referred to consists of an eight-cylinder, 8-in. x 10-in. gasoline engine, driving an electric generator. The forward truck underneath the engine is equipped with two 600-volt standard railway motors. The weight on the driving wheels effective for traction is about two-thirds the total weight of the car. The movement of the car is controlled by varying the voltage of the generator, combined with series-parallel connection of the motors. The engine control is provided with a combination air valve and gas throttle by which the engine is started on compressed air, and as soon as it begins running on gasoline the air is shut off. With this arrangement, the engine need be run only when propelling the car. Three or four seconds only elapse between the time at which air for starting is admitted to the engine and the movement of the car, so no perceptible delay is occasioned by stopping the main engine at the station.

Mr. James Anderson, General Manager, Sandwich, Windsor and Amherst Railway, and President Canadian Street Railway Association

The car is lighted by a small two-cylinder gasoline engine which drives a lighting machine. This small engine is also fitted with an air compressor cylinder to charge the air tanks for starting the main engine on its first run. The latter is provided with an air compressor, which maintains a pressure when the car is once in operation.

A demonstration car of this type has been operating for the past two years, carrying passengers on railroads in different parts of the country, and at the present time there are seven cars in regular service. A grade of gasoline satisfactory for the operation of these cars can be purchased for from 6 cents to 7 cents per gallon. The gasoline tanks will hold 150 gal., sufficient for at least 200 miles

on one filling. The gasoline consumption, per car mile, for cars weighing from 40 tons to 50 tons will vary from 0.5 gal. to 0.7 gal., according to the service conditions. On this basis for fuel, an estimated cost of operation per car mile, based on experience, is as follows:

Gasoline	$0.05
Supplies	.01
Maintenance (car body and trucks)	.01
Maintenance (engine and electrical equipment)	.03
Engineer, conductor and cleaning	.07*
	$0.17

*This item, in particular, will vary with the mileage and wages paid.

The car bodies are similar in respect to the engine compartment, the remainder of the interior and the entrances being modified to meet different requirements.

It is preferable that the cars be operated as independent units rather than to haul trailers, but as they are fitted with automatic air brakes, as well as straight-air, and with M. C. B. couplers, they can be used for trailer work, though at reduced speed.

The seats are nearly four feet long, and, not having arms, it is possible for three people comfortably to occupy one seat. The aisle is narrower than in steam practice, though wider than in many trolley cars. The largest cars at present under construction are 70 feet long and 10 feet 5 inches wide over all.

The width, inside measurement, is 9 ft. 6 in. This car, with a 6-ft. baggage compartment and allowing three passengers per seat, will seat ninety-eight passengers, and it is practically a complete train within itself. Such a car would have a maximum speed of about 50 m.p.h. on level track, and a scheduled speed of 25 m.p.h. with stops 2½ miles apart.

There are undoubtedly many lines now operated by steam which under existing conditions are unprofitable, on account of both high operating expense and small receipts, but on which the traffic could be very much increased by a more frequent service and a pleasanter mode of travel.

The self-propelled gas-electric car seems to fulfil these requirements at less cost than by steam and so accomplishes the double purpose of a better and cheaper mode of transportation.

Telephone Department

Magneto Harmonic Signalling for Small Plants

By Walter C. Freeman

From the writer's personal observations it seems that independent operators of the smaller systems of the generator call type have not given the harmonic system of selective signalling on party lines due consideration. This paper is intended to outline in a general way the operation and equipment of such systems and to compare their advantages with other methods of selective signalling in common use.

The underlying principle of ringing any bell on a line, independently of the other stations on the same line, by means of alternating currents of various frequencies, dates back to the early days of telephony. In fact, it was proposed in the early 80's by several prominent engineers of the time, but it was not until 1902 that the idea was carried out and placed in commercial operation, and then only in a small way. Since that time, however, several of the large independent telephone manufacturing companies have developed a highly efficient type of sub-station and central station apparatus so that the harmonic system is to-day generally recognized as the most practical and economical solution of the party line problem. It is only in the last few years, however, that harmonic ringing equipment has been used in generator call plants.

Heretofore, the most common means of selective signalling has been by the use of biased ringers in the telephones connected to either side of the line and ground. On a four party line each side of the circuit carried one negatively and one positively biased ringer connected to ground. Thus, with one terminal of the central office ringing generator grounded, the operator, by projecting a pulsating direct current of the proper polarity over either the tip or sleeve side of the line could "raise" any party on the line without ringing any of the other stations. As the biased ringers do not have a bridging connection to the line the alternating currents established by the hand generators when "calling in" would not produce a signal. In other words, a line of this kind is of the "central checking" type.

The difficulty of maintaining a permanent adjustment of the biased ringers, and the rapid extension of electric railways and power transmission lines into the outlying districts, created a demand in the rural operating field for a selective signalling system which could be maintained at a minimum expense and be free from noise due to earth currents. It is obvious from the following that the harmonic system fulfils these requirements with entire satisfaction.

The harmonic four party line is arranged with the telephones bridged across the circuit in the same manner as the open party line, but the ringers employed in the telephone instruments differ slightly from the usual type of ringer in that the armature and clapper rods are mounted on flexible reeds instead of on pivots and trunnion screws. These ringers are provided with reeds of varying degrees of flexibility and with armature weights so as to vibrate only in unison with an alternating current of pre-determined frequency, the frequencies most commonly employed for four party service being 16 2/3, 33 1/3, 50 and 66 2/3 cycles per second.

As an illustration of the principle let us assume that a 16 2/3 cycle ringing current is being projected over the line. The 16 2/3 cycle ringer only will respond as its natural period of vibration, determined by the flexibility of the reed and associated weights, is in perfect step with the energizing current in the ringer coils. The other ringers bridged across the line at the other stations will not be actuated sufficiently to produce a signal for the reason that their reed armature mountings do not possess that certain degree of flexibility to permit the clapper rod to vibrate in harmony with the 16 2/3 cycle current. To further prevent the possibility of "cross-ringing" the various ringing currents are projected at four different voltages conforming with the following table:

Station	Frequency	Voltage
Party No. 1	33.33 Cycles	100
Party No. 2	16.66 Cycles	75
Party No. 3	50.00 Cycles	135
Party No. 4	66.66 Cycles	175

We can in this manner independently select any telephone on a four party line by sending out from the central

once a ringing current of the proper frequency without the use of a ground connection or ringers employing springs and numerous other adjusting devices, which oftentimes necessitates an extra trip on the part of the trouble man, to say nothing of the resulting expense. The disadvantage of the ground connection in selective signalling of any kind is that its use in most localities produces a disturbance on the line tending to create extraneous noises which under certain conditions will become very strong and render the line unfit for commercial use. For this reason eight party harmonic lines are not to be recommended inasmuch as four of the ringers must be connected to one side of the circuit and the balance between the other side and ground.

The telephone instruments employed on lines of this nature are of the standard bridging type, the only difference being in the construction of the ringers as previously described and the use of a one microfarad condenser in the ringer circuit. The generators are of the three or two bar type. One manufacturing company equip their instruments with convertible ringers so that in case it is ever desired to install the telephone on an ordinary bridgeline it is only necessary to substitute a special pivot and trunnion type armature for the reed movement. Likewise the reed armatures are interchangeable to permit the use of a telephone at any of the four stations on the line. This has the advantage of lessening the number of telephones to be carried in stock to care for every-day needs.

At the central office it is necessary to provide some means of generating the various ringing currents. At first these currents were established by a series of four generators direct connected to a motor governed to run at a speed of 1,000 revolutions per minute. The generators being of the two, four, six and eight pole types would, of course, deliver currents of 16 2/3, 33 1/3, 50 and 66 2/3 cycle frequencies respectively. For convenience in generating, this series of frequencies has remained standard for harmonic signalling service.

The Convertor

The fact of multi-frequency generating sets being somewhat expensive to install and operate made the cost of harmonic service prohibitive to all except the largest operating companies having common battery exchanges. This feature held back the adoption of this kind of service by the small magneto plants until the development of the "convertor." The convertor consists of a series of four vibrating weighted reeds, each driven by a motor magnet to vibrate at a pre-determined number of periods per second. These reeds carry an arrangement of contacts similar to an ordinary pole-changer or interrupter to make and break current through the primary winding of a transformer associated with that particular vibrator. The secondary winding delivers an alternating current of the proper frequency and voltage to be fed to the ringing keys on the switchboard. The primary current supply may be drawn from a bank of dry or storage cells as desired, but the latter are to be recommended on account of their comparatively constant voltage.

It is not necessary to operate the convertor constantly under conditions where the volume of traffic is light, as starting relays may be conveniently added to the equipment a.ranged to close the motor magnet circuit only when a ringing key is depressed. This is a very desirable arrangement inasmuch as the battery is only in use during the actual period of ringing.

The switchboard equipment in respect to ringing apparatus is much the same as for use with the biased ringer four party service. The key itself is provided with a four button master selective key in exchanges where the number of harmonic party lines is comparatively small, but if the number is large it is much better to equip each cord circuit with a four button four party ringing key in order to eliminate any drag on the services of the operator. The 16 2/3 cycle current may be used for "straight" ringing on toll and rural lines and the 33 1/3 cycle for short individual town lines.

The cost of installing a four party harmonic ringing system averages about fifty cents per station higher than the biased ringer system for installations up to about 100 lines, but over that number the harmonic system is more economical to install. In view of the low maintenance cost of systems of this nature and its many advantages, it would be well for companies contemplating selective service to consider the harmonic system carefully.

Maritime Telegraph & Telephone Company

This company now controls the Nova Scotia Telephone Company, and through the Nova Scotia Telephone Company the Eastern Telephone Company in Cape Breton, the Valley Telephone Company from Windsor to Yarmouth, and the Yarmouth Telephone Company. They also control the Telephone Company of Prince Edward Island and the cable from the Island to the mainland, and lately acquired by purchase the control of the Queens County Telephone Company, of Liverpool, doing business in the Counties of Queens and Shelburne.

A Large Cable Shipment

The accompanying cut shows the largest single shipment of cable ever made in Canada. This is the cable for use in the distribution system of the City of Winnipeg's hydro-electric development, and comprised 75 drums of 3-conductor paper insulated lead covered cable for use in 13,000 volt service, and has been tested at 40,000 volts for ten minutes. There is a total of 50,000 feet of cable in this shipment with a weight of 550,000 pounds, and twelve cars

were required to carry it. In the foreground of the photograph will be noticed the special drum carriage for delivering the cable to the different parts of the city. This is also said to be the only carriage of its kind in Canada, and is very useful for handling the heavy reels.

This cable was supplied and is being installed by the Canadian British Insulated Company, Limited, Montreal.

Industrial Progress and Trade Notes

Weston Power-Factor Meters

The practice of adjusting power-factor by means of over-excited synchronous machines is now used on many important systems, and wherever such regulation is undertaken it is necessary to have some means of measuring the power-factor. Since power-factor regulation is made primarily to save money by utilizing all apparatus and circuits to their fullest extent, accuracy of the power-factor meter is of great economic importance.

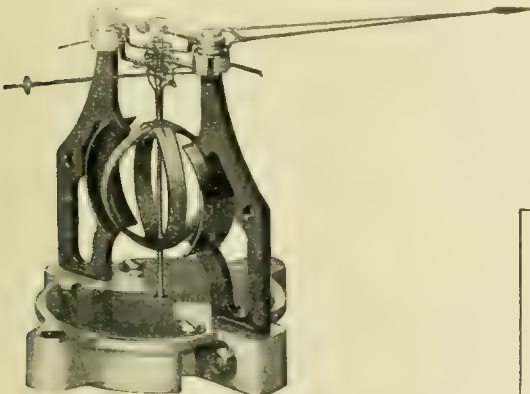


Fig. 1—Power-Factor Meter Movement.

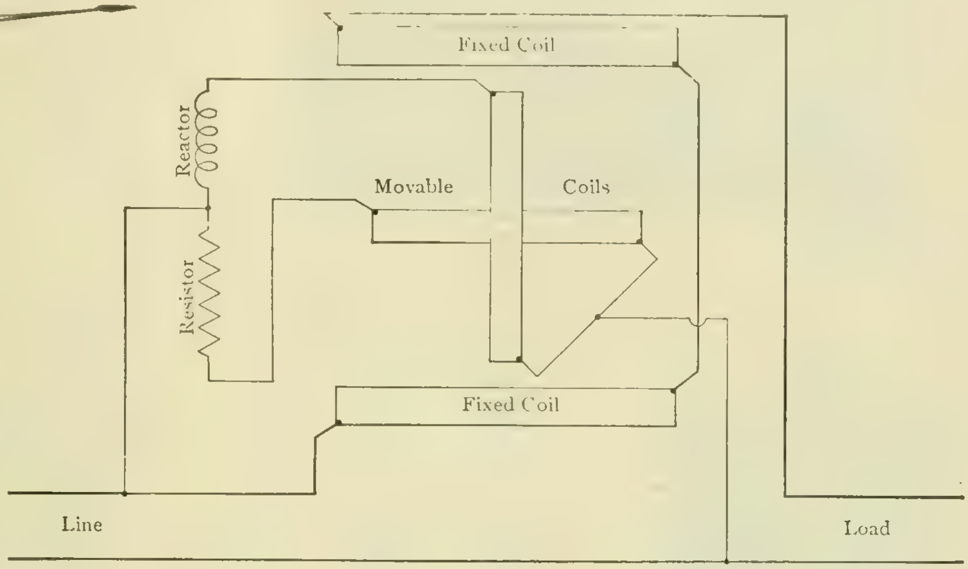


Fig. 2—Circuit Diagram Single-Phase Power-Factor Meter.

The Weston Electrical Instrument Company has recently placed on the market a new form of power-factor meter, which constitutes a considerable advance in the art. It is of the electrodynamometer type, but its mechanical construction is new in every detail. The general construction is quite similar to that of the new Weston switchboard wattmeter, recently described in these columns.

This new instrument consists essentially of two coils mounted at right angles to each other on the same staff and situated in the field produced by a fixed coil, Fig. 1. The movable system has no spring control, but is perfectly free to rotate. One movable coil is connected across the circuit; the fixed coil is connected in series with the same circuit, while the second movable coil is connected across a circuit, the e.m.f. of which is considerably displaced in time-phase from that of the first circuit.

Referring to Fig. 2, which represents a schematic diagram of the connections of a single-phase, power-factor meter, it is seen that when the current in one of the movable coils is in phase with that in the fixed coil, the movable system will turn until that coil is parallel with the fixed coil; that is, until the two fields coincide. If the field produced by the fixed coil is out of phase with both the fields produced in the movable coils, the movable system will take up a position such that the resultant field, which is in time-phase with the fixed field will coincide in space position with the fixed field. It is highly essential to the proper functioning of this type of instrument that the movable coils be identical in physical dimensions and placed permanently and symmetrically in planes which bisect each other at right angles.

This seemingly impossible condition of requiring two things to occupy the same space simultaneously is complied with in a most ingenious way. The coils are wound at the same time by a special machine and interlaced layer by layer at diametral crossing points. At these crossing points the windings are spread sufficiently to allow the insertion of the staff. Small curved plates cemented to the inside periphery of the coils and provided with holes that accurately fit the staff, serve to centre the coils and their axial position is permanently maintained by pins which pass through the staff and engage tiny ears on the above mentioned plates. This form of construction is a great improvement over the old method of winding two separate coils and forcing one inside the other.

Electrodynamometer power-factor meters require a metallic connection between the movable coil circuit and the external circuit and the construction of leads which will introduce no appreciable error is one of the most difficult problems in the construction of the instrument. In the new Weston power-factor meter the connections between the external circuit and the movable coils is made by extremely small spirals. They are so proportioned as to be self-sustaining and yet exert no appreciable torsional effect; 16,000 of them weigh only one ounce and the error caused by them is only one per cent. at 1-5 full load.

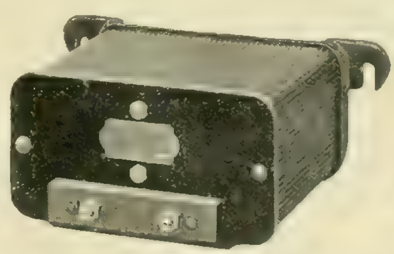


Fig. 3—Auxiliary Box

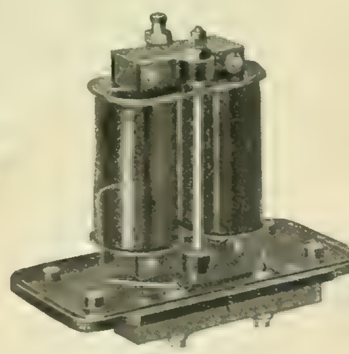


Fig. 4—Reactor.

The general belief has been that the electrodynamometer power-factor meter was inherently unsuited to use on single-

phase circuits, and, therefore, it is interesting to note that the new power factor meter may be used on single phase circuits without sacrifice of accuracy. This result is due partly to the novel construction of the movement, and partly to the reactor used in the phase-splitting circuit. The reactor resembles in appearance a core-type transformer. The core is made up of extremely thin laminations of special steel having low hysteretic constant and high permeability. The laminations are firmly bolted together to prevent vibration and thoroughly insulated so as to reduce eddy currents to the lowest practicable value. The air gaps, arranged so as to be susceptible of accurate adjustment, are placed inside the coils so as to utilize the shielding effect of the winding to prevent the formation of stray field. Air gaps outside, seriously affects the accuracy of the instrument. These reactors have a negligible temperature error and the resistance is entirely independent of the load.

Condit Oil Switches

Protective devices occupy the important position of controlling and protecting various classes of generating and translating electric machinery, and the selection of the proper protective device becomes, in the central station, whether large or small, a matter of much importance. If a device whose breaking capacity is just enough to take care of the present load is selected, the future growth of the company will necessitate its replacement. This replacement is a serious proposition, not only on account of the cost, but also from the fact that larger devices take up more room, and often generating and sub-stations are in such places that it is impossible to get the necessary increase of room. On the other hand, if at the present time devices are selected which will have an ultimate breaking capacity large enough for any possible increase of the station, the amount of money invested is abnormal in relation to the protection obtained, as the deivces are, necessarily, expensive for the amount of power they now control, and the increased cost of investment may run the price per kilowatt of the energy up a considerable amount.

At the present time the protective oil switches for alternating current work are divided into two classes, one for small stations, and one for extremely heavy stations, there being nothing in between. The Condit Electrical Manufacturing Company have developed a line of oil circuit breakers, cuts of which are shown in this article, which occupies a position midway between those for small stations and those for extremely large stations. These oil switches break upwards as do the oil switches for the largest stations, but have the same dimensions, outward appearance, and mechanical features as the smaller ones. Due to this breaking upwards and to other features of design, these switches are capable of operating heavy short circuits on large stations. Their guaranteed kilowatt capacity is approximately twice that of any switch of similar dimensions yet put on the market.

There is a particular need for this switch for motor work, and the type "LS" shown herewith is for that class of work. Switches are often installed on motors which are close to the generating system, and unless a switch of large breaking capacity is used, a short circuit is likely to cause damage, as the amount of energy which can flow through such a short circuit is enormous.

A sectional drawing is also given showing some of the details of construction. It will be noted that the break takes place at the bottom of the can where there is a large pressure of oil above it, that the oil cans are extremely heavy, and that there is a large space above the oil to allow the gases to expand.

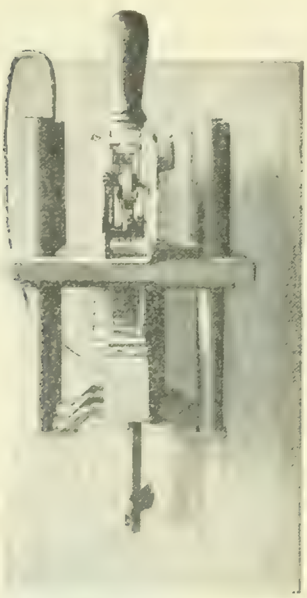


Fig. 1 Type LS Condit Switch.

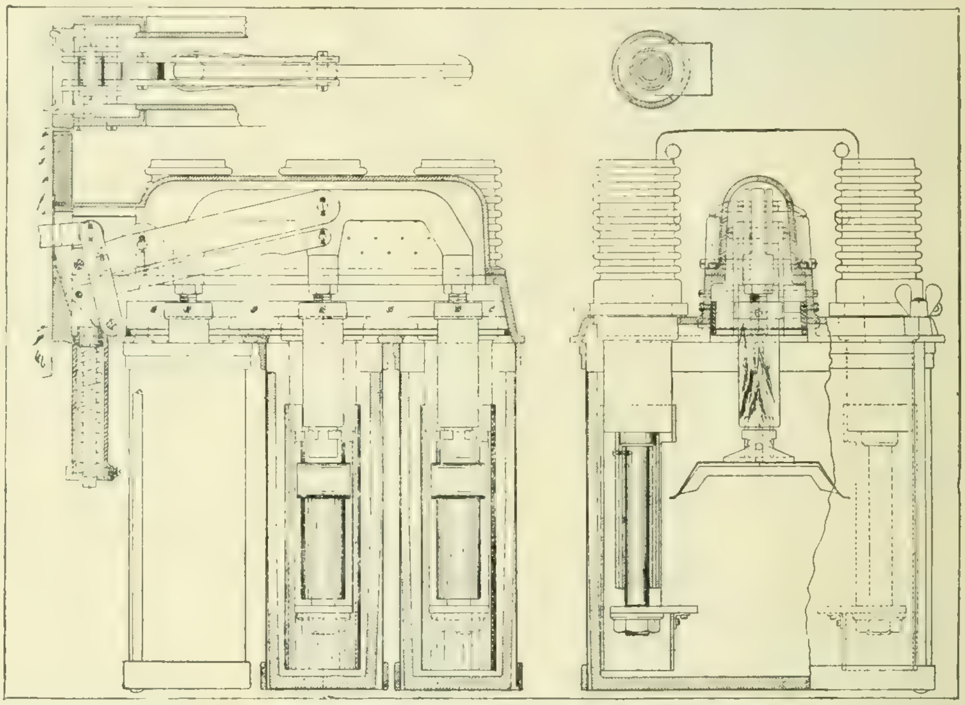


Fig. 2 -Cross-Sectional Details of LS Condit Switch.

This switch is made hand operated and electrically operated, in ampere capacities as high as 3,000, and in voltages as high as 60,000. The Northern Electric and Manufacturing Company, Limited, have the exclusive agency for this apparatus in Canada.

The Pittsburg Transformer Company announce that their Western Sales Agency will after July 1st, be conducted by the Delta-Star Electric Company, 617-631 W. Jackson Boulevard, Chicago, Ill. The western agency was formerly held by the Republic Electric Company, controlled by stockholders of the Delta-Star Electric Company. The officers of the Delta-Star Electric Company are H. W. Young, president, and A. S. Pearl, secretary.

Canadian Office Opened

The Holophane Company, Limited, opened its Canadian offices and stock rooms at 60-62 Front Street West, Toronto, on June 1st, where they are carrying a large and complete stock of Holophane glass and Holophane-d'Olier steel reflectors ready for immediate shipment. The Canadian company is under the direct charge of its general manager, Mr. C. A. Howe, assisted by Mr. H. D. Howe, as secretary, and Mr. Morgan P. Ellis, as sales manager. The general manager, Mr. Charles A. Howe, is particularly well known in electrical circles on the other side of the line, where he was vice-president of the Chicago Electric Club and a prominent member of the Illuminating Engineering Society. Mr. H. D. Howe has been identified with the Holophane Company for many years, while Mr. Ellis is well known in the Canadian west, where he has represented the parent company for some time.

Electric Service Supplies Co.

The accompanying cut represents the fine new office and factory building of the Electric Service Supplies Company at 17th and Cambria streets, North Philadelphia. The building is a 6-storey monolithic reinforced concrete fireproof structure.

Canadian Wagner Company Formed

The Wagner Electric Manufacturing Company, of Saint Louis, announces the formation of the Wagner Electric Manufacturing Company, Limited, of Canada, under a Dominion charter, with a capital stock of $50,000 fully paid. The Canadian corporation becomes the exclusive Canadian licensee under patents owned and controlled by the Saint Louis Company, which has granted exclusive manufacturing and sales rights for the full output of the Saint Louis Company. Mr. Alfred Collyer, who for many years has been a representative of the Wagner interests in Canada, and largely responsible for the volume of Wagner business here, has been appointed manager of sales of the new company. Various of the alternating current apparatus in which the Wagner Company specialize, including the new unity power factor and adjustable speed motors, have been patented in Canada and the new Canadian Wagner Company will proceed to manufacture and popularize these in Canada along the same lines as the Saint Louis Company does in the United States. It is expected that manufacture will begin within the current year. The officers of the new company, besides Mr. Collyer, are: S. M. Dodd, president; W. A. Layman, vice-president and general manager; W. S. Thomas, treasurer. The previous headquarters of the Wagner Electric Manufacturing Company, in the Bell Telephone Building, Montreal, becomes the headquarters of the new company.

Sangamo Company's Fine Building

We illustrate herewith the new building of the Sangamo Electric Company of Springfield, Illinois. The building is 160 feet x 42 feet, two storeys high, of steel, brick and concrete construction.

A New Engineering Firm

The recent formation of the consulting engineering firm of Woodmansee, Davidson & Sessions, with headquarters in the First National Bank Building in Chicago, has just been announced. Mr. Fay Woodmansee, the senior partner, has had a varied experience in government and large corporation work in various plants in the United States. Mr. C. J. Davidson is a specialist in the operation and management of power plants of various descriptions. Mr. E. O. Sessions has held such positions as construction engineer for the General Electric Company and has had charge of the designing and construction of some of the largest modern power plants. Every member of this firm holds a high record as an engineer and the combination will doubtless appeal to the public as a particularly strong one.

A Thermometer Invention

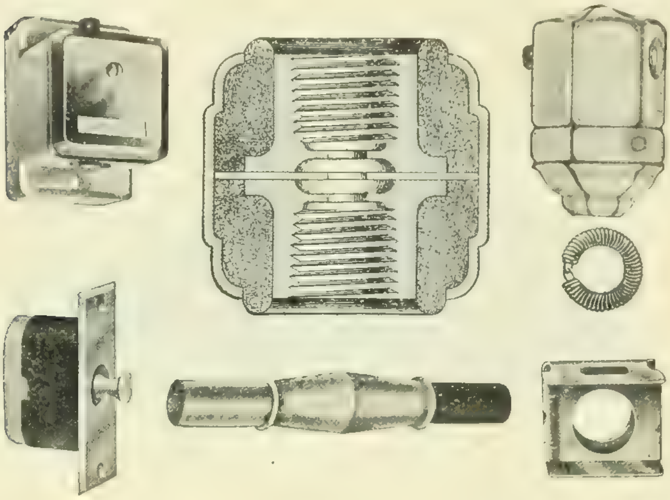
A thermometer for the indication of exceedingly fine differences in temperature and hence termed a micro-thermometer, has been invented by Mr. Louis V. King, of McGill University. The principle underlying the thermometer is that variations in the resistance of a coil of wire serve to indicate the changes of temperature of the medium in which the instrument is immersed. The coil has a resistance of 125 ohms. It consists of 250 feet of pure iron, silk covered wire wound on a copper cylinder. The thermometer is specially designed for the measurement of temperatures on the side of a vessel and consequently, the coil of wire is enclosed in a second copper cylinder and the whole is made water tight.

Use of this thermomter has been made in detecting the approach of icebergs. Up to the present time the method of taking temperatures has been to lip water up out of the sea and test as quickly as possible. This means that continuous measurements cannot be taken. With the new invention, however, by attaching an instrument similar in action to the oscillagraph a continuous curve is drawn and the slightest changes in temperature can be noted. In this way the proximity of icebergs can be detected and accidents avoided.

The Wirt Insulating Joint

The Benjamin Electric Manufacturing Company, of Toronto, has recently taken over the Canadian agency for the Wirt Insulating Joint. This is a comparatively new de-

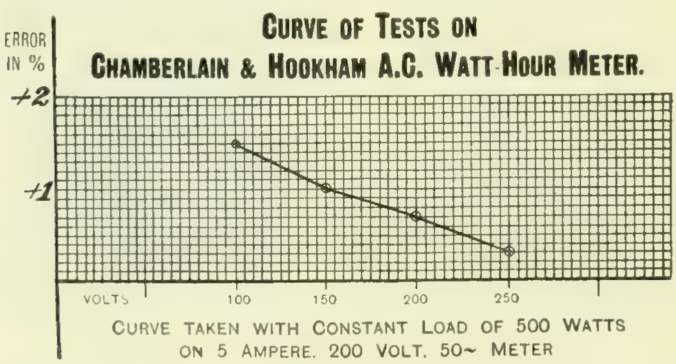
vice. It is claimed that it is the only insulating joint ever made that has the strength of an iron pipe coupling and that it will stand a wrench or torch without injury. This joint also has double insulation. The above company is also manufacturing and distributing the well-known line of Cutler-Hammer push-button specialties. It is claimed that



these specialties have the simplest mechanism ever used in electric switches or sockets and that the action is unusually snappy and positive. The company have also recently added to their line a new battery switch for automobile work, canopy switches for bracket and fixture use, and a feed-through switch.

Accurate Watt-Hour Meters

The curve shown herewith indicates very clearly the high degree of accuracy now being obtained by some of the best meter manufacturers. This particular curve shows



the results of tests on a Chamberlain & Hookham a.c. watt-hour meter, indicating that a variation in voltage all the way from 100 volts to 250 volts was only attended by a 1.2 per cent. variation in the accuracy of the reading instrument.

Trade Notes

The Westmount City Council has authorized the reduction of the rates for electric lighting to 7½ cents per kw. hour for a five year contract. The rate hitherto has been on a flat scale of 8 cents per kw. hour

The Sangamo Electric Company, Springfield, Illinois, announce that after July first their Chicago office will be located with the Delta-Star Electric Company, whose president, Mr. H. W. Young, is also manager for the Sangamo Company.

The Delta-Star Electric Company of Chicago have issued pages 11-14 of their sectional catalogue. These pages contain a complete description of the automatic and non-automatic Gibbs type train connectors for use in steam railroad train lighting.

Mr. Richard Lynch has been appointed secretary of the Montreal Electrical Association in the place of the late Mr. J. E. McDougal, who was drowned recently at Cartierville. Mr. Lynch is in the employ of Messrs. McDonald & Willson, 99 Drummond street.

The council of the Town of Outremont has adopted a by-law providing for a special loan of $175,000, a large portion of which is to be spent in diverting overhead wires into the lanes where this is practicable and of placing other wires in conduits. The City of Westmount is also studying the question of burying all the wires in that municipality.

The Canada Ford Company, of Montreal and Winnipeg, representing the Brush Electrical Engineering Company, announce that their principals are now executing in the steel turbine department of their Loughborough works, orders for government, municipal and electric supply apparatus, totalling in the neighborhood of 17,000 kilowatts, in units vary- from 450 up to 3,000 kilowatts in size.

The Montreal Electric Company, Limited, is doing the electric wiring for the Fairmount school, which is being enlarged for the Protestant Board of School Commissioners. This includes the electric lighting, the wires for which are carried from the street in iron pipe conduits; the electric fire alarm bell connections branching to every class room and the electric clock connections. Every class room will have its own clock regulated and governed by a master clock in the principal's office.

Trade Publications

Condulet Pocket Reference,—a manual just issued by the Crouse-Hinds Company. It illustrates and gives sizes of all condulets, besides designating the various covers, switches, cut-outs, or other fittings that can be used with each. A full line of porcelain receptacles, rosettes, and sockets for moulding and cleat and temporary decorative installation is also shown. Manual is pocket size.

Cut-out Cabinets,—catalogue No. 4, issued by the Columbia Metal Box Company of New York, descriptive of types "G," "P," and "W" Columbia Type Cabinets.

Federal Lock Clamp Bushings,—a sheet issued by the Federal Sign System, descriptive of their electric bushings.

Pass & Seymour,—a booklet issued by this firm, who are manufacturers of electrical specialties and porcelain of special design, Solvay, N.Y. The booklet describes a number of electrical decorative installations where the apparatus was supplied by this firm.

Despatchers Signals—for electric inter-urban railroads, bulletin No. 1001, issued by the Stromberg-Carlson Telephone Company. A well illustrated description of the signal systems as installed by this company for inter-urban work.

Some Buying Points in Electrical Machinery—An illustrated pamphlet issued by the Electrical Engineering Company, through their Canadian office, the Canada Ford Company, Montreal.

Reco Flashers.—Bulletin No. 14, issued by the Reynolds Electric Flasher Manufacturing Company, Chicago, Ill., covering suggestions and original ideas for spectacular flasher effects. Well illustrated.

Cedar Poles.—A booklet issued by the Lindsley Bros. Company, Spokane, dealers in cedar poles, ties, piling, red

fir, cross arms, etc. The booklet, among other things, contains valuable information regarding official specifications, inspection comments, table for inspectors, and information regarding cross arms.

Automobile Club of America.—A description of a testing laboratory operated by this club in New York City, to promote original investigation in the development of automobiles. The equipment of the laboratory is described, together with facilities for making the tests and the rules governing the tests.

Economical Steam Production.—A booklet issued by the Vulcan Soot Cleaner Company, of Pittsburg, being a presentation of soot cleaning as applied to all types of water tube and return tubular boilers with special reference to the Vulcan system.

Electric Power from the Mississippi River.—Bulletin No. 2, issued by the Mississippi River Power Company, describing the progress of their large development at Keokuk, Iowa.

Resistance to flow through locomotive water columns.—Bulletin No. 48, issued by the University of Illinois Engineering Experimental Station.

Telephone Apparatus.—Bulletin issued by the Kellogg Switchboard & Supply Company, covering all the important items in standard telephone work. Each item is illustrated, coded and given a brief description. Everything from binding posts to pole changers, or from dry cells to a 20,000 line exchange seems to have received consideration in this catalogue.

Canadian General Electric Company.—Condulet talks No. 134 and 135; also pamphlet "Electrocurl," explaining self-heating electric curling iron; also letters 208, 209, 210, dealing respectively with a keyless socket for large base lamps, and with a locking-type, flush, push button switch.

Electric Railway Mine Haulage Material.—Bulletin issued by the Ohio Brass Company, of Mansfield, Ohio.

Steam Hydraulic Presses.—Catalogue on steam hydraulic quick acting, forging and bending presses, issued by the Mesta Machine Company, Pittsburg, Pa.

Pittsburg Mazda Transformers,—Bulletin No. 1151, issued by the Pittsburg Transformer Company, descriptive of a new line of small low voltage transformers. These are adaptable for use on electric signs, and in interior low voltage lighting.

Pittsburg Bell Ringer.—Bulletin No. 1152, issued by the Pittsburg Transformer Company, descriptive of transformers to be used on electric bells, thus doing away with the use of dry batteries.

The Worthington Turbine Pump.—Bulletin 108, issued by the John McDougall Caledonian Iron Works Company, Montreal, descriptive of types of centrifugal pumps, designed for various heads and speeds, and built in any capacities.

Valves and Steam Specialties.—Catalogue K., issued by the Ohio Brass Company, Mansfield, Ohio. The Canadian trade will be especially interested in the Ohio gauge cock, water gauge and pressure regulating valves, shown on pages 28 to 55.

Economic Operation of Incandescent Lamps.—Bulletin 17, issued by the engineering department of the National Electric Lamp Association, discussing the subject from the standpoint of both consumer and central station.

Mazda Incandescent Street Lighting.—Bulletin 16, issued by the engineering department of the National Electric Lamp Association, revising former bulletins on this subject, and giving distribution curves for some of the latest types of reflectors.

Installations in Textile Mills.—A leaflet issued by the Ideal Electric Manufacturing Company, Mansfield, Ohio, describing the motor installation in the mill of the Mansfield Elastic Web Company.

Holophane Data Sheets.—A new section of the Holophane catalogue containing data and results on actual installations, for example, a typical Childs' restaurant, in New York City. The results of exact photometric tests are tabulated therein.

Street Lighting Posts and Poles,—an illustrated catalogue, No. 20, issued by the Morris Iron Company, of Frederick, Maryland, manufacturers of posts, poles, standards, brackets, reflectors and specialties for outdoor lighting.

Electrical Measurement Instruments,—a catalogue issued by Robert W. Paul, London, England, manufacturers of electrical instruments and scientific apparatus.

Meter Verification

Mr. Ormond Higman, chief electrical engineer of the Department of Inland Revenue, has advised the Canadian Electrical Association that the Packard Electric Company, of St. Catharines, have arranged for the admission to verification in Canada of their type "PK" meter. This is an adaptation of two of their single phase type "K" instruments arranged to measure balanced or unbalanced polyphase circuits, and is built for either 3-wire or 4-wire, 2-phase or 3-phase, lines.

St. Lawrence Flour Mills Installation

The St. Lawrence Flour Mills Company, Montreal, have approximately 1,000 h.p. in motor equipment installed. Power is obtained from the Canadian Light & Power Company at 11,000 volts, 60 cycles, 3-phase, which is reduced by three kv.a. oil-insulated, self-cooled transformers, to 2,200 volts, at which voltage one large 700 h.p. 233 r.p.m. motor operates. This motor is direct connected to the main shaft and is a Westinghouse type HF machine, specially designed for this purpose.

Three 60 kv.a. oil-insulated, self-cooled transformers further reduce the voltage from 2,200 to 550 volts, at which the remainder of the motors in the plant operate. These motors are Westinghouse type CCL. machines of the following sizes and speeds: one 100 h.p., 580 r.p.m.; one 40 h.p., 580 r.p.m.; one 20 h.p., 850 r.p.m.; one 10 h.p., 850 r.p.m.; one 10 h.p., 1120 r.p.m.; two 5 h.p., 1120 r.p.m.; two 15 h.p., 1700 r.p.m.. Besides the above mentioned, which are squirrel-cage motors, there is also a 30 h.p., 850 r.p.m. type HF Westinghouse motor.

The lighting circuit is taken care of by three 15 kw. 2200/110 volt transformers, and fluctuations in the voltage are guarded against by the use of a 5 kw. automatic induction regulator.

What is believed to be the only machine of its kind operating in the Dominion, is the attrition mill driven by two type CCL 1700 r.p.m. motors, running in opposite directions and started simultaneously from one starter.

The 4-panel Westinghouse blue Vermont marble switchboard is equipped with the latest design of instruments for the control of the above described apparatus, and presents a very handsome appearance.

The motors were wired for and connected up by the Montreal Electric Company, Limited.

618. **Electric light fittings, etc., etc.**—A Lancashire firm manufacturing all kinds of electric light fittings, radiators, and electrical accessories, wish to extend their business in Canada.

Current News and Notes

Berlin, Ont.
It is said negotiations are proceeding favorably towards the acquisition of the franchise of the People's Railway Company by the Canadian Northern interests.

Blyth, Ont.
By-law carried for electric light. Owners, Village of Blyth; clerk, A. Elder, Blyth. Authority given to buy electric light plant and extend fire protection.

Brandon, Man.
A number of ornamental five-globe standards will be installed.

Tenders have been called for an electric pumping equipment of 2,000,000 gal. capacity. Diesel oil engines will be used as the prime mover.

Brockville, Ont.
Equipment for sale. Power plant, (St. Thomas street Station). Engineers, Laurie & Lamb, Board of Trade Building, Montreal. Complete electric generating set, consisting of Leonard Peerless steam engine, direct connected to 150 kw. Canadian General Electric generator, 2,300-volts, 60-cycles; also condenser, switchboard, steam and exhaust piping, spare parts for engine and set as at present installed. Full particulars, etc., obtained from engineers.

Edmonton, Alta.
This city, by a large majority, defeated the by-law to provide $100,000 towards the initial development of the Grand Rapids on the Athabasca river some 200 miles north of here.

The Edmonton city council has awarded the contract for one car load of steel wheels to Gorman, Clancey & Grindley, agents for the United States Steel Corporation.

Farnham, Que.
The corporation of the town of Farnham will be able shortly to take over their new combined hydraulic and steam-driven electric plant. It is now practically complete and is being tested prior to acceptance.

Fernie, B.C.
Mr. A. C. Stielon, a pulp-mill manufacturer, of Milwaukee, has been looking into the power question here with a view to considering the advisability of building a pulp mill.

Fort Francis
The fight which has been in progress for some time between the town of Fort Frances and the Ontario and Minnesota Power Company will be resumed before the Senate.

Fraser Mills, B.C.
The electric crane operating on the wharf at the Fraser mills is capable of lifting 7,500 pounds at the extreme end of the 105 feet reach, and carries 350,000 feet of lumber daily, distributing it to and from all parts of the wharf and loading car skids. As a labor-saving apparatus it has proved that where formerly from eight to ten men were required three to do the work.

Fredericton, N.B.
TheEel River Power Company, of which Hon. H. A. Connell of Woodstock, George McPhail of the same place, and Messrs. John G. and Geo. A. Murchie, of Calais, Me., are the chief promoters, have lately finished the survey of the lakes in the vicinity of Canterbury and have also surveyed the site for two dams near Benton. The work was done under the direction of Mr. Fred Baird, C.E. It is the intention of the company to furnish power in this city and St. Stephen, Woodstock and other towns and to establish electric light and power plants in these towns. The matter of starting a street car service in this city is also talked of.

Galt, Ont.
The Water Commission of this town propose installing an electric pumping system and are negotiating with the Fire and Light Committee for a supply of Niagara power.

Goderich, Ont.
A by-law will be submitted to the ratepayers on August 5 to ratify an agreement with Mr. John L. Brodie for the supply of 325 horse power of electric energy to the town at the rate of $34 per horse poyer year.

Guelph, Ont.
The new street lighting system was turned on the evening of Coronation day and gave great satisfaction to the citizens.

The Hydro-electric Commission proposes a transmission line between Guelph and Owen Sound with feeders to supply towns by the way.

Hamilton, Ont.
A by-law will be submitted on July 25th to raise $505,160 for the purpose of hydro-electric power and light distribution.

Hochelaga, Que.
Gas Meter. The Montreal Light, Heat & Power Co., of Montreal, will erect a gas meter house at Hochelag , cost $7,000.

Ingersoll, Ont.
For sale—steam and electric machinery. Owner, Power and Light Commission, Ingersoll, Ont. Steam and electric machinery, one 156 h.p.; one 225 compound condensing Wheelock engine in good condition; boiler 14 ft. x 60 ins. and 12 ft. x 48 ins. complete with iron work and steam connection; condensers, heaters, belt tighteners, pulleys and shafting, direct current electric dynamos and motors from one to eighty h. p. For further particulars write W. R. Reynolds, Supt. Power & Light Commission, Ingersoll

Kamloops, B.C.
A preliminary report by H. K. Dutcher, engineer, has just been made to council advising the development, for both water and electric supply, of Paul Creek. The capacity of the river is about 30 foot seconds, which, with a 420 foot head, is calculated to develop 1,200 h.p. The estimated cost is $150,000, including $60,000 for a gravity water supply system.

Kenora, Ont.
Mr. Charles Brent, general manager Canadian Homestake Mining Company, is negotiating with this town for a supply of power. An offer has been made him of 300 h.p. at $15 and later 1,000 h.p. at $10, delivered at the town's boundary line.

Lindsay, Ont.
A by-law will be submitted to the electors choosing between the purchase and operation of the local electric light plant by the town or the granting of a franchise to the Electric Power Company. Before the vote is submitted, however, careful data will be prepared on the development possibilities and costs of Fenelon Falls.

Martintown, Ont.
Negotiations in progress for new telephone company. Owner, Martintown Telephone Co. Pres., A. Climgen; secretary, Hy. Kinloch. Organization of joint stock company to erect and operate lines in this locality in connection with the Bell Telephone. Steps being taken to secure subscribers to stock.

Millbrook
The Midland Construction Company are delivering material at Fraserville, Millbrook and other places for the new power line which is being put through from Healy Falls via Millbrook to Port Hope by the Electric Power Company.

Mimico, Ont.
The council has decided that the proposal to install and maintain a plant for the use of Niagara power is too expensive at present. A three-year contract has been made with the Erindale Power Company which operates a 1,200 kw. plant on the Credit River.

Mitchell, Ont.
The distributing station will probably be ready to use Niagara power around the first of August.

Moncton, N.B.
The Moncton Tramways, Electricity and Gas Company have received instructions from Mr. E. A. Mitchell, the company's consulting engineer in England, to proceed with the laying of the main pipe line by direct route from the wells in Albert county to this city. The contractor is Mr. R. W. Whelpley. The company propose laying a pipe line which will be capable of delivering over 10,000,000 cubic feet of gas a day, thus anticipating the probable future requirements of Moncton in the event of new industries being established here. Over two miles of low pressure main have been laid in the different streets of Moncton.

Montreal, Que.
Ald. Dandurand's motion to allow signs overhanging the sidewalks in this city was defeated by 18 to 3.

It is stated that the Isle au Heron Development Company has acquired the rights to develop electric power at Lachine Rapids. 40,000 h.p. is spoken of as the capacity.

Action has been entered for $7,110 against the city by the Montreal Light, Heat and Power Company, and the Montreal Gas Co., as the result of alleged interference with the distribution of gas through the city due to the sewer construction on Sherbrooke street.

Napanee, Ont.

A vote will be taken here on July 24 to authorize an agreement including the sale of the electric light plant and the granting of a franchise to the Seymour Power & Electric Company.

Nelson, B.C.

Following trouble with generator No. 2 of the city power house a new shaft was installed by the Nelson Iron Works. It is reported after a month's operation that the machine is now satisfactory.

The evils of the flat rate system are being evidenced here since it is known that a number of citizens are using flatirons and heating utensils without notifying the authorities. It has been decided to place any such, who may be caught, on meter and charge them a 12½ cent rate.

Application for license for power purposes. District Water Commissioner, W. F. Teetzel; A. L. McCulloch, mining engineer, Nelson, has made application for license to use 6,300 feet of water for power purposes from the Kootenay River at Granite. The parties behind the project, although names have not been disclosed, are understood to be strong enough financially to carry the work through. Alternative proposition, Mr. McCulloch has also recorded a similar amount of water at Slocan Junction, five miles below Granite.

The smelting companies of the Kootenay and the Boundary districts have appealed to the provincial government against the notice given by the West Kootenay Light & Power Company of a 40 per cent advance in the price for power. The operators declare that under the new rate their production costs will be increased to such an extent that the conduct of the smelting business at a fair profit will be rendered extremely problematical, while the advances are characterized as beyond reason. The protest was filed with the Provincial Secretary by Manager Sylvester, of the Granby Company. The West Kootenay Power and Light Company, and other electrical enterprises subsidiary to that company, or controlled by Mr. Lorne A. Campbell, the managing didector of that corporation, now controls all of the power marketed in the district mentioned.

Niagara Falls, Ont.

Work in progress for power plant, $66,000. Owner, American Cyanide Co., Niagara Falls, Ont. Electric furnaces, retorts, cranes, conveyors. Extension of factory. The company have started work on extension. Work being done by day labor.

Orillia, Ont.

The by-law voted on to raise by debentures eighty thousand dollars for an extension of the electric power plant was carried by a vote of 603 for and 85 against. This sum will be about equally divided, half going to build transmission lines and install equipment to carry power from the Big Chute, the other half towards a new power plant.

Tenders are called for the construction of twenty miles of high tension transmission line. Specifications in office of the town engineer, Mr. W. K. Greenwood.

Ottawa, Ont.

Tenders are being received by the Department of Naval Service for the erection of a wireless telegraph station at Tobermory, Midland and Sault Ste. Marie.

The Ottawa & Morrisburg Electric Railway has now $135,000 worth of stock sold. All that is required for organization purposes is $125,000, so that there is $10,000 to the good. The organization meeting will be held at Morewood, July 28, where the head office of the company is at present. It is expected that a very substantial start will be made this year.

Penticton, B. C.

Tenders called for installation of generators. Owner, Municipality of Penticton. Engineers, F. H. Latimer, Penticton, B. C. Mather, Yuill & Co., Ltd., 429 Pender street, Vancouver. Supply of material and labor in connection with installation of two 100 K.V.A., 3-phase, 4,600 volt, 900 R.P.M. alternating current generators direct connected to impulse wheels operating at 2,045-ft. effective head; pressure pipe line about one mile of 10-in. and one mile of 12-in. pipe; switchboards, transformers, meters, distribution and street lighting system. Plans, etc., at offices of engineers, or may be seen at office of Electrical News. Tenders in duplicate received by F. H. Latimer until 8 p.m., Aug. 10.

Port Arthur, Ont.

Mr. O. Robinson, general manager of the street railway system, states that the power generators are greatly overloaded.

Port Stan'ey

It is said a by-law will be submitted authorizing the expenditure of $10,000 or $12,000 for the purchase of the local plant, the construction of a transmission line from St. Thomas and the installation of a small 150 h.p. sub-station.

Portage la Prairie.

W. E. Skinner, electrical engineer, has submitted a report to the city council on the value of the Central Electric Company's property.

Prince Rupert, B.C.

Plans have been prepared and a bylaw will probably be submitted asking the necessary permission to install a combined waterworks and hydro-electric plant. An 18 inch pipe is called for, half of which can be used for electric development giving about 150 kw.

Quebec, Que.

A vigorous campaign looking to the installation of a number of modern electric signs on the business streets is in process.

Regina, Sask.

Work is being rushed on the power house extension and it is expected the new generator will be in readiness for the Dominion Fair.

Ruskin, B.C.

The power transmission wires of the Western Canada Power Company will likely reach Vancouver in about two weeks from date, and by the 1st of September the company hopes to be in position to deliver 25,000 h.p. in electrical energy along the 45 mile power line between Stave River development works and Vancouver. About 500 men are now rushing work on the plant, and several train loads of heavy machinery is being installed. An agreement has been arrived at between the Western Canada Power Company and the Great Northern Railway Company whereby the former will have the use of the latter's right of way from Burnaby to Vancouver to bring its power and light wires into the city. The current will be brought to Burnaby substation, which is now about completed, and there stepped down from 60,000 volts to about 13,000, for transmission to the city.

Sarnia, Ont.

Plans will be prepared by the town engineer for the installation of a municipal lighting system. Negotiations are pending for the purchase of the Sarnia Gas & Electric Light Company.

Saskatoon

A by-law has been passed regulating the erection of overhanging signs. The new by-law states that permission must be obtained in the erection of such signs from the electrical superintendent, and the necessary permit taken out at a cost of $1.00. A clause has also been inserted that if a man is allowed to put up such a sign he must also keep it lighted from sunset until 10 p.m. every night. He must also keep it in shape by painting it once every two years.

This city on July 6 passed a by-law granting a franchise for the construction and operation of a street railway. The company receiving the franchise was represented by Mr. H. W. E. Evans, of Edmonton. Mr. Evans' plan includes the development of a power plant on the South Saskatchewan River. This power will be used to operate the street railway when built and the bylaw just passed also provides for the purchase by the city for its own use of all surplus power. The agreement calls for the commencement of the power plant within one month of the approval of the plans and of the railway construction within three months of the signing of the contract. Franchise is for twenty years. Payments to the city increase from 3 to 5 per cent. of the gross earnings depending on the length of time the road has been operating.

Selkirk, Man.

The town of Selkirk has employed the W. E. Skinner, Limited, consulting engineers, in connection with either the installation of a new plant or the making of arrangements with the city of Winnipeg or the Winnipeg Electric Railway Company for power.

Sherbrooke, Que.

Dam construction work is going ahead on the Rock Forest hydro-electric plant of the city of Sherbrooke. This is to be completed by the end of October.

At a special meeting of the shareholders of the Sherbrooke Railway & Power Company the purchase of the assets of the Stanstead Electric Company and the Eastern Townships Electric Company was ratified.

St. John, N.B.

A Toronto concern is asking for privilege of establishing electric power and heating plant at Milltown, N.B. Address town clerk, Milltown.

St. Thomas, Ont.

The Hydro-electric Commission's account for June for 402 horse power was at the rate of $32 per horse power.

Residents of Yarmouth township, in the vicinity of St. Thomas, have peti-

tioned the council to supply them with hydro-electric power, and the council will ask the Commission to furnish plans and estimates

Tilsonburg, Ont.

Hydro-electric power was turned on by E. C. Jackson, chairman of the Tilsonburg Hydro-electric Commission, for the first time on July 1.

Messrs. E. C. Jackson and George W. Tillson have been, by acclamation, elected commissioners to manage the hydro-electric power system here.

Toronto, Ont.

The Boston office of the Holophane Company, in charge of Mr. H. C. Jones, moved into new quarters on the 26th of June. The new address is No. 10 High street, where both the offices and stockrooms are now located.

The city's filtration plant at the Island is about ready for a test but there is not sufficient power to work the pumps. Delay in the supply of electric power is caused by a failure, on the part of the city and the commission, to agree on the method of transmission across the narrow strait that separates the Island from the mainland.

Mayor Geary, Controller F. S. Spence and Corporation Counsel H. R. Drayton, recently interviewed Hon. Mr. Pugsley and asked that the city be given permission to carry the Hydro-electric power wires across the Western Channel in order to provide light at the Island and to operate the waterworks plant there. Mr. Pugsley said that Mr. Hunter, his deputy, had been much impressed by the arguments advanced in favor of carrying the electric wires over the western channel instead of under water. He said that he would take up the subject with Mr. Hunter again at once, and would give an early reply to the request of the city of Toronto.

Vancouver, B.C.

The Western Canada Power Company has filed application with the city council for permission to carry its wires along certain streets, according to agreement.

The Pacific Electric Heating Company, which give promise of ultimate large proportions, are establishing themselves here and are nearly ready for operations.

City Electrician McCrossan, of Vancouver, has returned from a month's leave of absence, during which he visited many of the leading cities in the east to study the lighting systems in use. During his absence Mr. W. E. Hughes was acting inspector.

The British Columbia Electric Railway Company has entered into a ten-year agreement with the city council of Sumas, Washington, just across the border of this province, to supply current for electric lighting. There is no duty to be paid in exporting power to the United States

General Manager Henderson, of the Bull River Falls Power Company, in Fernie district, makes the welcome announcement that the company has now ample capital to complete the installation of machinery at the Falls and to build the necessary transmission lines. Mr. Henderson hopes to be able to market power within a year.

The British Columbia Electric Railway Company has adopted the Watson fender invented and controlled by W. T. Watson, Davie street, Vancouver, as being the best contrivance on the market for the saving of life. Over 125 of the fenders are already in use on the city cars, and the company's shops are turning them out as rapidly as possible. The Toronto Street Railway has also adopted the Watson fender.

Owing to the rapid growth of New Westminster, the British Columbia Electric Railway has planned to greatly extend their city service as soon as the new station is completed, which will be in the near future. The improvements will include the extension of the service to Fraser Mills, where there is a population of 1,200. Three lines connect Vancouver with the Royal City, on two of which there is an hourly service and on the third every fifteen minutes. The latter line is partly double-tracked, and work on the last link of this system from Keefer Station in Burnaby to New Westminster will be completed this fall.

Vernon, B.C.

The town of Vernon will expend $6,000 in extending its electric light system.

Victoria, B.C.

New machinery in the shape of transformers, switchboards and 150 arc street lamps have arrived in the city for the city street lighting system. As soon as the machinery is installed steps will be taken to put up the lamps, the positions for which have already been decided upon.

The citizens of Victoria recently passed a by-law authorizing the borrowing of $50,000 to cover the cost of extending the city's electric lighting system and improvements in the power station to enable it to handle the increased power soon to be delivered by the British Columbia Electric Railway Company. The power house betterments will cost $11,000.

Walkerton, Ont.

The Walkerton Electric Light and Power Company propose building a dam across the Saugeen river and developing the water fall there for use in this town.

Winnipeg, Man.

It is understood the Winnipeg Railway Company will make use of the city's underground conduits in the downtown districts to carry feed wires for the street railway system.

Yorkton, Sask.

Now the new crude-oil engine is in operation to supply this town with power and light there is an agitation for 24-hour service. It is felt that industries cannot be obtained without this inducement and though the day service may not immediately pay expenses that the town will gain eventually in the added attractiveness of a continuous service.

Condensed Department

RATES

Positions Wanted, Positions Vacant, Miscellaneous. } 2 cents a word and 25 cents for a heading, per insertion.

Tender advertisements, equipment for sale, etc., 15 cents per agate line (14 agate lines make one inch) per insertion.

Advertisers who wish to conceal their identity may do so by using an Electrical News box number without extra charge.

Forms close on the 18th of each month.

Positions Wanted

Electrician

Practical, theoretical and commercial, open for engagement; 20 years' experience in high tension, over-head and under-ground work; also designing, erecting and running power plants; good organizer and hustler; first-class references. Box 298, Electrical News, Toronto, Ont. 8-8

Positions Vacant

Correspondent Wanted

A London weekly publication wishes to arrange with somebody who is in close touch with electrical affairs in Canada for the prompt and regular supply of Canadian electrical news. H. Alabaster, Gatehouse & Company, 4 Ludgate Hill, London, Eng. 8-8

Sales Manager Wanted

An electrical manufacturing concern in Toronto, in excellent standing, whose business is growing rapidly, wants young, capable man, not over 30 years of age, to take charge of office and assume position of sales manager. Only live ones, not has beens, need apply. Give full particulars. Strictest confidence promised. Good salary for the right party, with opportunities for rapid promotion. Apply Box 299 Electrical News, Toronto, Ont. 8-8

Tenders Wanted

Tenders in duplicate will be received by the undersigned until **August 10th, 1911**, at eight o'clock p.m., for the supply of all materials and labor in connection with the installation for the Municipality of Penticton, of two 100 kv.a., three-phase, 4,600 volt, 900 r.p.m. Alternating Current Generators, direct connected to impulse wheels operating at 2,045 ft. effective head; pressure pipe line of about one mile of 10-inch and one mile of 12-inch pipe, switchboards, transformers, meters, distribution and street lighting system.

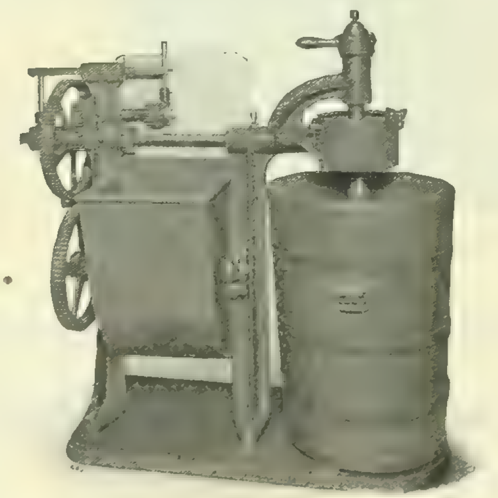
Plans and specifications may be seen at the offices of F. H. Latimer, Consulting Engineer, Penticton, B.C.; Mather, Yuill & Company, Limited, Vancouver, and the Electrical News, 220 King Street West, Toronto, after July 7th.

Tenders shall be plainly marked "Tender for Hydro-Electric Plant," and shall be accompanied by an accepted Bank Cheque for five per cent. of the tender, payable to the Municipality of Penticton, B.C.

The lowest or any tender not necessarily accepted.

F. H. LATIMER, C.E.,
Penticton, B.C.

June 26th, 1911.



Prize for a Safe Electric Miner's Lamp

The British Home Secretary announces that in order to encourage the production of safe and efficient types of electric lamps for miners, a colliery proprietor has placed at his disposal the sum of £1,000 to be offered as a prize for the best lamp or lamps fulfilling certain specified requirements.

The conditions of the competition are as follows:

(1) The competition will be open to persons of any nationality.

(2) It will be in the discretion of the judges to award the whole of the prize for the lamp which they consider to be the best, or to divide the prize, or to make no award if no lamp appears to them to be of sufficient merit.

(3) The lamps must be addressed, care of Mr. C. Rhodes, at the Home Office Testing Station, Rotherham, England, and must reach the testing station not later than December 31, 1911. A spare globe should accompany each lamp.

The requirements which should be fulfilled by any lamps submitted for competition are as follows:

(1) The lamp should be of sound mechanical construction so as to withstand rough usage.

(2) The lamp should be of simple construction, and easy to maintain in good order and repair.

(3) The lamp should be so constructed as to render impossible the ignition of inflammable gas either within or without the lamp.

(4) The lamp battery should be so constructed that any liquid which it may contain cannot be spilled when the lamp is in use, and means should be provided for dealing with any gas which may be generated by the battery.

(5) The materials used and the construction should be such that metals and other parts will not be liable to deterioration by corrosion as a result of the action of the electrolyte, etc., used in the battery.

(6) The lamp should be effectively locked, so that it cannot be opened without detection.

(7) The lamp should be capable of giving not less than two candlepower continuously for a period of not less than ten hours.

(8) The light should be well distributed outside the lamp. A movable reflector to concentrate or to shield the light may be provided.

In addition to the above requirements regard will be paid to (a) the first cost of the lamp, (b) the cost of maintenance, (c) convenience in handling, and (d) the weight of the lamp when charged and ready for use.

Longueuil Lighting and Waterworks Plant

The Longueuil lighting and waterworks plant, which is electrically run with power supplied by the Montreal Light, Heat & Power Company, with reserve steam power in case of emergency is in operation and ready for acceptance by the civic authorities. This town is being lighted by high efficiency incandescent bulbs. This town is now said to be the best lighted town in Canada, the claim being made that with a large number of incandescent bulbs installed about eighteen feet above the ground and near the sidewalks an evener light is obtained than that given by arc lamps. This system also avoids the shadows cast by arc lamps. There are no carbons to be replaced every day, no transformers, as the street lights are on the same circuit and carry the same current as the house lighting. Practically the only repairs required are occasional new bulbs as they get broken or burn out. These globes last from 1,200 to 1,500 hours so that this is a small item.

Electrical News

Generation, Transmission and Application of Electricity

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Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

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Central Station Aggressiveness

It is a matter of frequent remark that the average central station manager is not sufficiently aggressive in pushing the sale of such electrical appliances as will mean the levelling up of his load with its consequent increase in revenue. It is true that special rates are frequently given at off-peak hours and the customers are occasionally 'nagged' at for not using more current and modern appliances, but in what is probably a majority of the cases the company sits down and waits, half fearing that some wide-awake customer will crop up necessitating the expenditure of a little more capital. Quite a number of companies have recently adopted the plan of opening show and demonstration rooms where the modern electrical household conveniences may be shown in action. The problem however met by the central stations is not in convincing their customers of the convenience, the aesthetic luxurious value of electrical appliances in general but in convincing them that they NEED these articles in their homes and business.

Now the proper appreciation of an electrical iron or fan or other similar article does not often result from a single demonstration. A certain enterprising and successful manager in a small Ontario town has gone the demonstration idea one better and instead of keeping his stock of electrical necessaries exhibited in a dusty window he has placed them all, his irons, his fans, his toasters, his percolators, etc., with the exception of a single sample in each case among his most likely customers. For example, he goes into a stuffy office on one of these hot August days carrying a cool looking electric fan with the remark "I thought you would like to borrow one of my fans to put you through this hot spell. You are very welcome to use it until a customer comes along." The result in nine times out of ten is that the need of this fan so grows on the customer that when it is called for he says "Well, can't you leave this one with me. I find it a great help in my work and would like to buy it." Similarly the housewife on ironing day, the hostess before her little teas and so one down the line, are all approached at the opportune moment. It is the manager's business to know that moment, and take advantage of it, and when he does the results are nearly always the same. Make your customers acquainted with the value of your wares by actual and continued use and the supposed luxury quickly becomes a valued necessity.

Canadian Section of the Electro-Technical Commission

A meeting of the Canadian Committee of the Electro-Technical Commission was held at the Electrical Standards Laboratory, Ottawa, on Thursday, July 27th, at which were present Professor Herdt, in the chair; Professor L. W. Gill, Mr. Ormond Higman and Mr. A. B. Lambe. The first business was the election of Mr. A. B. Lambe as secretary, Mr. J. L. Stiver finding it impossible to continue in the office owing to his removal to Toronto.

Considerable discussion then took place regarding the finances of the committee. Up to the present the Dominion Government has borne all outlays, and will continue as far as is known at present to be responsible for the yearly fee of $250, which is paid by the Canadian committee, in comcon with all the other branches, to the central office in London, England. The government, though, does not feel that it can appropriate more than that amount to this work, and in view of this, and of the fact that the work of the committee is of great value to the electrical industry throughout Canada, it was decided to communicate with the principal electrical manufacturers in Canada, the Canadian Society of Civil Engineers, and the Canadian Electrical Association, in an effort to obtain financial assistance for the Committee.

This assistance is more especially necessary at the present time, as without it Canada cannot be represented at the forthcoming General Conference at Turin, Italy, a state of affairs which the Committee feels would be very deplorable, particularly as almost every other member country has arranged to be represented.

Up to date the Committee has to acknowledge three very kind subscriptions of $100 each from the Canadian General Electric Company, the Canadian Westinghouse Company, and the Canadian Society of Civil Engineers, and so at the present writing it has every hope of being able to send a delegate to Turin.

The question of membership to the Canadian Committee was also discussed, as owing to some removals which have taken place since the Committee was organized, its membership is not as representative as it should be in the best interests of all concerned. The secretary was therefore instructed to arrange, if possible, for members to be added from the Allis-Chalmers-Bullock Company, the Canadian Crocker-Wheeler Company, the Canadian General Electric Company, the Canadian Society of Civil Engineers, and the Packard Electric Company. As a result Mr. James Kynoch, the Chief Engineer of the Canadian General Electric Company, has been nominated to membership, and other additions are expected shortly. The Committee now stands as follows: Prof. Herdt (Chairman), Can. Elect. Association; Prof. Barnes, McGill University; Mr. W. A. Duff, Can.

Westinghouse Company; Prof. Gill, Queen's University; Mr. Higman, Dominion Government; Prof. Rosebrugh, Toronto University; Mr. J. J. Wright, Toronto Electric Light, Toronto, and Mr. A. B. Lambe (Secretary) Dominion Government.

The Committee then discussed the various reports which are to be laid before the Turin Conference, in order to be in a position to promptly formulate its instructions to the Canadian delegate, should one be appointed. The principle of these reports deals with a universal equation for Ohm's law; the standardization of symbols for current, voltage, etc., so that I will represent current, R resistance, etc., the world over; a standard vector representation for lagging and leading currents, and a list of electrical machinery terms.

The next meeting will be held as soon as the Committee is in a position to decide the question of representation at Turin.

Conservation Commission Report

The second report of the Commission of Conservation of Canada is just to hand. At the first annual meeting of the committee on waters and water-powers it was recommended that steps be taken to obtain and tabulate complete information on the subject of the waterways of Canada and to supplement that information by examination and inspection; also that this information include statements of the development of powers which have taken place, their scope and market, the amount used by the public and the prices charged. At the same meeting the committee declared by resolution that in future there should be no unconditional titles given to water powers but that every grant or lease of such powers should be subject to development within a specified time, should be subject to public regulation of rates and to a rental with power to revise the same at given periods.

In accordance with these resolutions steps have been taken during the past year to collect information. Mr. Denis the engineer of the Commission has covered Quebec and the Maritime Provinces working with the district engineers of the Public Works Department, resulting in a report containing all available information respecting the water powers of Quebec. The Maritime Provinces about which little was known in respect to water powers is being covered more fully by Mr. A. V. White, by whom a report will be prepared for publication in the near future. Before leaving for the east Mr. White had spent nearly a year on the water powers of Ontario and a comprehensive report giving all available information about that province is the result.

The secretary of the commission, Mr. James White, was detailed to procure whatever information was to be had regarding the water powers of Western Canada. Here of course, much less authoritative information can be obtained but whatever Mr. White was able to procure will be included in the report soon to be issued and which will cover all the provinces of the Dominion.

During the past year the usefulness of the Commission has demonstrated itself time and again in valuable ideas and opinions that have been rendered on various projects or pieces of legislation in the Dominion. Among these are included the following projects:—

(1) Damming the St. Lawrence—a scheme proposed by a group of American capitalists for damming the St. Lawrence river at the Long Sault Rapids near Cornwall. This scheme was strenuously opposed by the Commission and was finally laid over. It was also defeated in the United States Congress.

(2) The St. Lawrence Power & Transmission Company—the incorporators were evidently the same as those behind the scheme for damming the St. Lawrence. In this case the Dominion Parliament, under pressure from the Commission, amended the bill so that the company could neither acquire water-powers, generate electricity nor export it.

(3) International Waterways Canal & Construction Company—the incorporators in this case practically asked for entire control over the waterways, and the water powers thereon, from Lake Superior to the head waters of the Saskatchewan River. As the whole scheme seemed to be merely a cloaked attempt to monopolize the water powers along the route of the proposed canal it was strenuously opposed by the Conservation Commission and finally the bill was thrown out.

(4) Nelson River Railway Company—a bill to incorporate a company to build a railway from the northern extremity of Lake Winnipeg, and in its original form would have conferred extensive water power rights, including the acquiring of the Grand Rapids on the Saskatchewan River. At the instance of the Commission the bill as passed allows the company to acquire (not expropriate) and develop water-powers on the Nelson and Saskatchewan Rivers only if these are necessary for the purposes of its undertakings. It may sell its surplus power, but the rates must be approved by the Board of Railway Commissioners.

(5) The Nipigon & Albany Canal & Transportation Company—Though the ostensible purpose of this company was to construct a canal from Nipigon Bay on Lake Superior, via Lake Nipigon to the Albany River, and from there to James Bay, in reality the bill contained clauses which might have alienated the water powers of the Nipigon, Ombabika, Ogoki, and Albany Rivers. Owing to opposition the bill was not reported.

(6) Export of power at Fort Francis—at this point the generating company asked for power to export 6,000 horse power out of 7,000 horse power said to be developed on the Canadian side. The Commission of Conservation reported on the matter with the result that the Government subsequently sanctioned the issue of a license, valid for on year only, permitting the company to export one-half of the power developed on the Canadian side.

The members of the committee on water and water powers, to whom the thanks of the Dominion of Canada are due for the excellence of their work during the past year, are Mr. F. D. Monk, chairman; Hon. Jules Allard, Hon. Frank Cochrane, Hon. W. C. H. Grimmer, Mr. C. A. McCool, Hon. W. R. Ross. The chairman of the Commission is Hon. Clifford Sifton, who has recently expressed his generous determination to retire permanently from politics and devote the remainder of his life to the conservation of Canada's varied and immense resources.

Operating Experience on 100,000 Volt Transmission Lines

At the recent annual convention of the American Institute of Electrical Engineers held in Chicago, reports were presented on four of the half dozen high tension transmission systems at present in operation in America. These dealt with the Great Western Power Company, Southern Power Company, the Great Falls Power Company and the Central Colorado Power Company, all operating at 100,000 volts or a little above that mark. The reports of the experiences with all of these lines is interesting in that they indicated that the operation on high voltage lines does not seem to be attended with any greater difficulties than attend 40,000 or 50,000 volt systems.

The Great Western Power Company operates about

155 miles of transmission line. The nominal voltage is 100,000 at 60 cycles. Double circuit, steel towers are used throughout. The high tension sides of all the transformers are delta connected. There is no grounded connection except through the electrolytic lightning arresters. One ground wire is carried along the apex of the tower for lightning protection; this is grounded at every tower. This company has never had any lightning experience, for the reason that there have been no lightning storms in that vicinity since the lines have been in operation. The charging current on this line is somewhere between 4000 and 7000 kv.a and it is recommended that on a line of this sort each generating unit should have a capacity at least equal to the charging current on one line. In the Great Western Power Company's plant nothing less than 10,000 kw. generators are used. There is no appreciable corona effect on the line. Suspension insulators are used, only three or four of which have broken down during a full year's operation of the lines, and this may have been due to mechanical defects.

The Southern Power Company's line is also operated at 100,000 volts. Double circuit towers are used. Three overhead ground wires are installed, one from peak to peak, one on each side of the tower. This company has experienced frequent lightning storms, but the 100,000 voltage lines have withstood the lightning effects better than the lower voltage lines of the same company. On one part of their system 96½ miles long there have been 8 shutdowns totalling 38 minutes due to lightning. On another part of their line 161 miles long there have been 14 shutdowns totalling 59 minutes. These figures cover approximately 18 months' continuous operation. Wind has caused no trouble whatever on the line, and no corona effects to speak of have been observed. No trouble is noticed due to corrosion at the tower footings. In the matter of voltage regulation there is no more difficulty with the 100,000 voltage line than with their 44,000 voltage line. Step-up transformers are delta connected on the 44,000 voltage side, star connected on 100,000 voltage side with neutral ground.

The Great Falls Power operates a total of 282 miles of line at 100,000 volts. Over part of this distance two separate single circuit tower lines are strung. All transformers on the system are delta connected and give good satisfaction. Two ground wires are used, clamped to the steel towers and thus grounded at every tower, as the tower legs extend six feet in the earth and terminate in flat steel footings. Several lightning storms have been experienced but no shut-downs have been occasioned from this cause and only mild discharges have taken place over the arresters. Up to the present time there has not been a single insulator failure. No difficulty has been experienced from the swinging of the wires in the winds. The maximum deflection observed to date has not been over 30 degrees. In this connection it is noted that a considerable deflection is observed in insulators which are located between a long span and a short span due to changes in temperature. The tension in a short span varies more with changes in temperature than does the tension in a long span, consequently during cold weather the insulators deflect along the line toward the short span while in hot weather the deflection is in the opposite direction. It is recommended that a wire clamp should be employed with a long bearing surface on the wire and a relatively short distance between the wire and the hinged point which separates the clamp, as this form of clamp will prevent a sharp point in the wire if the insulator stands at either extreme of its swing. This plant is fully loaded with an induction motor load and the lagging current taken by the induction motors so nearly balances the charging current of the line that the power factor of the plant averages 99 per cent. Electrolytic lightning arresters are used at both ends of the line and in the middle.

When the line of The Great Falls Power Company was first put in, corona effects were plainly visible on every live part of the system. These effects became less and less however, and entirely disappeared after about three weeks operation. The inference is that this discharge took place from points caused by rough handling or otherwise and that these points gradually wore off or burned off leaving the surface of the wire smooth.

With reference to the voltage variation along the line of the Great Falls Power Company it is stated that at no load there is a 3.5 per cent. rise in voltage. With a load of 15,000 kw. (capacity of the plant is 21,000 kw.) at 85 per cent. power-factor, on the two lines the drop in voltage is 7 per cent. With all of the load on one line the voltage drop is 17.5 per cent. The opinion was expressed that the operation of a 100,000 voltage system is no more difficult than a 50,000 voltage system and that indeed the extra high insulation often prevented break-downs due to lightning and surges which would cause trouble on a lower voltage line.

The Central Colorado Company had experienced 10 interruptions from 63 lightning storms on the high tension lines. The 13,000 volt circuits gave more trouble than the high pressure lines. Owing to peculiar wind conditions it had been found necessary to increase the spacing of conductors at one point. No difficulty experienced with high-tension switches and early trouble with h.t. bushings and terminals has been eliminated.

Judging from the results of the operation of these lines not less than from the successful operation of our own still higher voltage line in Ontario, it is pretty clearly proven that the difficulties feared owing to the gradual increase of transmission voltage are not proving formidable. Indeed, the reverse rather would seem to be the case, for in each of the reports mentioned above it was stated that some of the difficulties experienced with the lower line did not appear at the higher pressure and we understand the operation of the Ontario line has been so successful as to justify the engineers of the Hydro-Electric Commission in considering the feasibility of a still further increase in transmission voltage on some of the lines planned for construction in the near future.

Canada Year Book 1910

The Canada year book for 1910, issued by the Dominion Government, is just to hand and contains some interesting information with regard to electrical matters in Canada during the past year.

There are 7 telegraph companies doing business in Canada, the Great North Western Company, with 11,134 miles of line, the Canadian Pacific Railway Company, with 12,257 miles of line, the Western Union with 2,639 miles, Temiskaming and Northern Ontario Railway 265 miles, Algoma Central Railway 130 miles, Grand Trunk Pacific Railway 1,699 miles, the North American Telegraph Company 605 miles; total, 28,729 miles.

The electric railway mileage totals 1,049 miles. The capital expended in Canadian electric railways totals $102,000,000. The yearly earnings are $17,000,000 of which operating expenses take $10,000,000.

The number of electric light companies registered under the electrical inspection act during the year ending March 31, 1910, totalled 398.

The Chatham, Wallaceburg & Lake Erie Railway Co. have purchased another Westinghouse electric locomotive.

Electricity in the Modern Home

One of the most interesting and instructive exhibits at the Canadian Industrial Exposition which recently closed in Winnipeg, and one of particular interest to ladies and central station men, was the bungalow, "Home Sweet Home," wherein the City Light and Power Department demonstrated the many useful and artistic ways in which electricity comes to the aid of the modern housewife.

The bungalow comprised a kitchen, dining room, hall, living room and boudoir complete, every detail of which spoke comfort and unusual artistic taste. It was in every way a model modern home, from the dainty boudoir, with its cheery electric grate, and the many electrical toilet appliances, to the thoroughly equipped electrical kitchen, where the latest cooking, ironing and washing appliances were given practical demonstration before the large and intensely interested crowds. In addition to the standard sized cooking utensils, there was brought from Chicago a special range weighing over two thousand pounds. This had a large broiler attachment, where the milk fed chickens were cooked for the banquet served at the close of the Exposition.

Adjoining the kitchen was the dining room, pleasantly lighted by the soft yellow light from candelabra, while on the sideboard was the quiet fan, the electric chafing dish, the toaster and percolator, and for the baby, an electrically heated nursing bottle.

The living room across the hall from the dining room with its comfortable chairs and furnishings, and the soft light and cosy grate for the cool evenings, was an almost

Electrical Exhibit, Canadian National Exhibition, Winnipeg.

irresistible attraction for the tired business man. The electric cigar lighter saved the dirt and danger of matches, and for the children there was a corn popper. An electrical piano provided further entertainment.

That the exhibit was a complete success was proven by the attendance and the questions asked. On Citizens' Day over 10,000 people visited the house, and few went away without asking questions. A daily bulletin was published and ten thousand copies were distributed on Citizens' Day alone. The bulletin gave the cost of the majority of the furnishings and appliances in the house, and proved excellent advertising for the city's new power department.

The last night of the Exposition the Mayor, the controllers and the members of the council were guests of Mr. and Mrs. Rossman at the first electrically cooked dinner served in Winnipeg. This was prepared in the model kitchen, and was a complete success from every point of view. After the dinner, a menu of which is reproduced

The Modern Boudoir, Industrial Exhibition, Winnipeg.

herewith, the guests were entertained by music and impersonations by the members of the power department, all of whom contributed to the success of the exhibit.

MENU

Punch
Grape Fruit
Maraschino
Bouillon
French Rolls
.... Celery Radishes Olives Onions Beets ....
Salted Almonds
White Fish Parsley Sauce
Milk Fed Chicken
Creamed Potatoes Asparagus French Peas
Lemon Sherbet
Combination Salad
Fruit in Season
Cake Ice Cream
Bon Bons
Toasted Crackers Roquefort Cheese
Coffee
"Partagas" Cigars Cigarettes
Mints

To Mrs. Rossman and Messrs. Mitchell and Lockhart, of the power department, belong the larger share of the credit for the success of the demonstration.

The Proper Treatment of Victims of Electric Accidents

It is a fact not too well known that invaluable assistance can be given those injured by electric shocks in much the same way as assistance is given an individual who has been some time in the water. Just as many cases are on record of persons apparently lifeless from drowning being resuscitated after hours of proper treatment, so the victims of electric shocks from time to time have been revived after all hope of results had been abandoned. It is very probable that many cases of fatalities might have resulted differently if proper assistance had been immediately available. This has come to be recognized among those who have made a special study of the best methods of resuscitation, but it is doubtful if the average electrician is aware or has ever thought much about the possibilities along this

line. It is just as necessary, however, that every man engaged in electrical work or likely to come in contact with those who are so engaged should make himself conversant with the most improved methods of resuscitation of injured persons as that we should all have a fair idea of what to do in the case of a drowning accident.

This important matter was discussed briefly at the last meeting of the Canadian Electrical Association, but undoubtedly did not receive the attention which its importance would seem to demand. At that time Mr. T. C. Martin spoke of investigations the N. E. L. A. are making, and said that later in the year a report would be issued incorporating the latest information on this subject. This report will be eagerly watched for and studied.

An interesting article has just appeared in The Electric Journal on this subject. The article is written by Dr. Charles A. Lauffer, medical director of the relief department of the Westinghouse Electrical & Manufacturing Company. As is generally known, and in common with many other large companies, it is the practice of this firm to hold weekly classes of instruction in the art of artificial respiration in order that all its employees may become familiar with the proper method to be followed. Dr. Lauffer has been connected with this work for many years and speaks on this subject with the highest authority. The article deals with general injuries such as burns, sore eyes caused by flashes, less severe shocks as well as more dangerous

accidents, and indicates the proper treatment to be followed in individual cases.

In a previous issue of the same journal Dr. Lauffer outlined definitely the plan to follow in emergencies of such a serious nature that artificial respiration has to be employed and these rules as there outlined may well be posted up in a conspicuous place and studied by every electrical worker. The directions were briefly as follows:

(1) The man is laid upon his stomach, face turned to one side, so that the mouth and nose do not touch the ground.

(2) The operator kneels straddling the patient's hips or kneels on either side of the hips facing the patient's head. (See Fig.)

(3) The operator places his spread hands upon the lower ribs of the patient and throws his own body and shoulders forward so as to bring his weight heavily upon the lower ribs of the patient.

The operator's downward pressure should occupy about three seconds, then his hands are suddenly removed. Squeezing the chest in this manner forces the air out of the lungs. On release of the pressure the elasticity of the chest walls causes them to expand and the lungs are refilled with fresh air. This act should be repeated indefinitely at the rate of about twelve times a minute. It often requires from one half to two hours.

If there are others to lend assistance supplementary stimulation may be given, such as (a) aromatic spirits of ammonia; (b) a dash of cold water on the face; (c) spanking the buttocks. No liquid should be given as stimulant.

It is the expressed opinion of E. A. Schafer, professor of Physiology in the University of Edinburgh, that "the prone pressure method of artificial respiration proves to be completely efficacious and capable of effecting an air exchange greater than that produced in normal respiration." This conclusion was reached after all other known methods had been tried out under the auspices of the Royal Medical & Chirurgical Society of London, of whose committee Professor Schafer was chairman.

It will be seen that the methods to be followed are greatly similar to those in case of drowning accidents, and it is equally necessary in both cases that not one single instant should be lost before operations are commenced, and that these operations should continue without cessation for a much longer period than is ordinarily supposed necessary.

Mitigating Electrolysis Troubles

An interesting paper was recently read before the Engineering Society of Western Pennsylvania describing troubles due to electrolysis of the underground pipes of gas, electric light, telephone, telegraph and water systems of Pittsburg caused by stray electric currents from the return circuits of the street railway system. The paper describes very carefully the methods taken to show that the trouble was due without question to stray electric currents and then proceeds to outline the methods followed in determining the relative electrical condition of the rails and underground pipes throughout the whole city.

The authors considered that there were six more or less prominent methods of mitigating electrolysis troubles (1) The double trolley system. (2) The return pipe feeder system. (3) Use of alternating current. (4) Insulating the joints of the pipe lines. (5) Coating all underground structure with a non-ionizable coating. (6) The bonding of all rails as return feeders.

The system used in Pittsburg was the return pipe feeder system, the rails being cross connected to the pipes at frequent intervals, using very heavy conductors. This method was found to reduce the trouble almost to a minimum when a sufficient number of cross connections were made. This, however, proved a very expensive method of removing the trouble. At the same time the authors of the paper expressed themselves as of the opinion that corrosion was still proceeding, although the rate of deterioration seemed to be too slow for detection, and would probably not be sufficient to injure the pipe during its natural life.

Considerable criticism of this method of remedying electrolysis was expressed in the discussion which followed. Professor Ganz believed that the Pittsburg system was wrong both in principle and practice, and stated that the authors had not even mentioned the one particular system which has received almost universal recognition and which is the only one with a correct theoretical foundation, namely, the radial insulated return feeder system. He instanced the recent troubles in Winnipeg which resulted in all bond connections to underground structures being removed and the radial system of insulated return feeders being installed, which drain the rails of current so that there is practically no trouble to underground pipes.

Professor Herdt has also expressed himself clearly on this point in a recent issue of the Electrical News. In a paper in the July, 1911, issue, entitled "Railway Troubles Due to Electrolysis," he states that "experience has demon-

stated that the proper method of preventing electrolysis is to reduce stray currents to a minimum and the remedial scheme used and advocated by some to bond the tracks with the water and gas pipes increases the amount of stray current and must not be encouraged." Professor Herdt also emphasizes the necessity of distributing the sub-station judiciously throughout the railway system so as to limit the amount of return current passing through the rails.

The Pittsburgh method of bonding the rails to the pipes certainly is not generally favored, but it must be admitted that the results in that particular case are highly satisfactory judging from the statement made in this paper that during the last four years no noticeable effects have been observed though careful watch has been kept at variout points of the underground system.

Progress of Work on the Extensive System of the Electric Power Company in Central Ontario

The sub-stations at Brighton, Colborne, Cobourg and Port Hope are now in operation. Possibly the most interesting of these at the present time is Cobourg. The sub-station is designed to contain three 750 kv.a. oil insulated, water cooled, three-phase transformers, stepping down from 44,000 to 2,400 volts. Two of these transformers have already been installed and have been in operation for some weeks. The entire electric load of the Cobourg Utilities Company has now been transferred to the new sub-station. The old system was 125 cycles, 1,100 volts, single-phase, whereas the distribution from the new sub-station is 60 cycles, three-phase, 2,400 volts. 24-hour service is now being given instead of the dusk to dawn service of the past. This will enable the company to take care of power customers satisfactorily. There were between 90 and 100 service transformers on the old distribution lines. About a dozen of these could not be used in connection with the new system as they were wound for 1,100 volts only. The remainder were re-connected for 2,200 volts, practically all of them operating satisfactorily at the new voltage and frequency. This is a tribute both to the manufacturing companies which furnished the transformers and also to the old management of the Cobourg Utilities Company on account of the fact that transformers which were purchased for operation on an 1,100 volt, 125 cycle system, prove to be entirely satisfactory for 2,200 volt, 60 cycle circuits. The 35-light, constant current arc transformer is now being rewound for 60 cycles by the Canadian General Electric Company, who have loaned a 60-cycle transformer to the Cobourg Utilities Company to carry the street lighting system while the old transformer is being re-wound. The change over of both the street lighting and commercial lighting was made with practically no interruption of service. The Cobourg Utilities Company, in addition to furnishing electric light and gas, also furnishes the Cobourg water supply and as soon as a new motor driven pump has been installed, which should be in the course of the next week, the old steam plant will be entirely shut down.

This is an interesting example of the work the Electric Power Company are doing in working out a unified system at standard frequency, phase and voltage for the various cities, towns and villages of Eastern Ontario, and providing an ample supply of power, 24 hours a day, to take care of all the needs of the district.

The Oshawa, Deseronto and Bowmanville sub-stations will be in operation by September 1st, and the Newcastle sub-station during September.

The power house and transforming station of the Sidney Electric Power Company on the Trent River, just north of Trenton, will also be in operation by September 1st. This will provide an additional 4,000 h.p. and enable the various sub-stations to take on additional power customers. The present generating stations at Campbellford having a capacity of something over 5,000 h.p., have now been running for some time, up to the full limit of their capacity, with a daily load factor of from 80 to 90 per cent.

Napanee

On July 25th the town of Napanee passed a power by-law by the decisive vote of 408 to 46 in favor of selling the municipal electric light plant to the Seymour Power & Electric Company, Limited.

The old plant, which was installed in 1906, contains two 125 kw., 60 cycle, 2-phase generators, each belted to a high speed engine, installed in a substantial stone building with concrete floor and roof. The street lighting equipment consists of two 25-light regulators with a mixed system of series enclosed arcs and series tungsten lamps. The entire plant is in first-class operating condition, having been constructed in a thorough and workmanlike manner in the first place, and since then has been well maintained. The town realizes that they are taking a step in the right direction by selling out to the Seymour Power Company, which will result in obtaining a 24-hour power and lighting service instead of the dusk to dawn service of the past. A substantial reduction in rates will also be put into effect as follows:—

Street arcs will be reduced from $70 to $55 per lamp per year.

Series tungsten for street lighting reduced from $20 to $15. The commercial and residence lighting rate will also be reduced from 10 cents to 8 cents per kw.h. and meter rentals will be abolished. An alternative rate for residence lighting will be 10 cents per room per month plus 3 cents per kw.h.

Power rates will not exceed $25 per h.p. hour for 24 hour service. The benefits of the town are therefore substantial and the prospect of a plentiful supply of reliable electric power at low rates will result in the expansion of industries now in the town and in the establishment of new ones.

The Seymour Power Company's 44,000 volt transmission line is now complete as far as Deseronto and will be extended to Napanee, where a sub-station will be built in order to make the necessary delivery of power. This power can be furnished from power houses either at Campbellford or Trenton, so that the duplicate sources of power will ensure a reliable service.

Healy Falls

The Eastern Power Company, Limited, one of the subsidiary companies of the Electric Power Company, Limited, have commenced construction work on the development of Healy Falls on the Trent River about five miles north of Campbellford. At this point there is a head of 76 feet. The initial installation will consist of two 3,000 kw. horizontal generators each driven by a 5,600 h.p. turbine fed from a separate steel penstock. The power house is designed to contain two additional main units of the same size as above or four in all. The third and fourth units will be installed as soon as the power demand warrants it. Three phase transformers will also be installed in the power house in order to step up to 44,000 volts for transmission. The generators will be wound for 6,600 volts in order to take care of the power demand in the vicinity of the power house. The load on the Electric Power Company's system is rapidly increasing at the present time, and the prospects are that by the time the initial installa-

tion at Healy Falls is completed, which should be about a year from the present time, the total capacity of the first two units will have been contracted for. One of the most recent power contracts closed is with the Canada Cement Company for the supply of 1,000 h.p. for their Belleville mill, which is situated at Point Anne, about four miles east of Belleville. It is expected that the sub-station will be complete and the mill running, electrically-driven, by the end of September. When this mill is operated electrically, the Canada Cement Company will be taking 4,000 h.p. in all from the Electric Power Company in the vicinity of Belleville, the Lehigh mill having now been operated from the Electric Power Company's lines, taking about 3,000 h.p. since the early part of this year.

Northumberland Pulp Company Additions

It is now somewhat over a year since the mill of the Northumberland Pulp Company at Campbellford was put into operation with two electrically driven 3-pocket pulp grinders, and during that time have required about 800 electrical h.p. to drive the mill. At the time of the first installation provision was made for extensions and the company now have on order a 1,000 h.p. motor to drive two additional pulp grinders, and will also install a number of additional auxiliary motors on centrifugal machines, screens, wet pumps, etc. This installation will be completed in the course of the next two or three months, by which time the Pulp Company will be using at least 2,000 h.p. furnished from the Seymour Power Company's Campbellford power house.

Alterations are now being made in the Northumberland Paper Company's old mill at Campbellford, which will result in increased economy of operation.

This will include installation of about 200 h.p. in motors, for which the power will be supplied by the Seymour Power Company. These alterations will be followed up by further changes, on a more extensive scale during the coming year, by which it is contemplated driving the entire mill electrically, which will require in the neighborhood of 600 h.p.

Auburn Power Company

Good progress is being made in the construction of the new power house of the Auburn Power Company at Peterboro. three 500 kw. generators will be installed and it is expected that the station will be in operation in October. A transformer station is also being built near the power house so that any surplus power not required in Peterboro may be stepped up and transmitted over a 44,000 volt transmission line, which is now being built from Peterboro to Port Hope, to connect Peterboro with the rest of the Electric Power Company's system, of which this company is a subsidiary.

The firm of Smith, Kerry & Chace are the designing and construction engineers for the Electric Power Company, and are also operating engineers for the system.

Changes in B. C. E. R. Staff

The following announcement was recently made by the Board of Directors of the British Columbia Electric Railway Company, Limited: "Some staff alterations have been made involving the transfer of one of the assistant managers from the operation to another department, which has been created during the visit of the directors to British Columbia. Mr. F. R. Glover has been appointed to the position under the title of General Executive Assistant While the directors regret that this appointment will sever Mr. Glover from active participation in the operating end of the company's business they are glad to think that Mr. Glover will now have more time to devote to giving them the benefit of his experience and advice on those questions of policy which are constantly arising. The directors take this opportunity of publicly acknowledging the valuable services which Mr. Glover has rendered to the company for so many years past. The General Manager, Mr. R. H. Sperling, will have under him two assistant managers, viz: the Chief Engineer, Mr. G. R. G. Conway and Mr. Glover's successor, who will deal with the operating department. The directors feel that Mr. Sperling, enjoying as he does the full confidence of the Board, will, with his two assistants, continue the skilful and efficient control of the company's business the success of which has been largely due to his able management and far-sighted policy."

Progressive Calgary

A pamphlet has just been issued by Mr. Andrew Miller, industrial commissioner, Calgary, in the interests of the city of Calgary and district. The attractions of Calgary include a very fine street railway system which superintendent Thos. McCauley has just recommended to the double tracked on practically every line completed or under construction. The total cost of double tracking is estimated at about $140,000.

The superintendent also states that their new lines will be in operation by the end of August and that 5 new cars will be added to the system about that time making a total of 30 cars now in use. A requisition has also been sent in for 18 more cars to be ordered immediately.

It is also said that the farmers' railway from Calgary to Carbon, a distance of 60 miles, is now assured. It is not certain as yet whether the road will be operated by electricity, by gas or gasoline combined with electricity, or by gas or gasoline alone.

Duplicate Order for Jordan River Plant

Considerable interest has been aroused in connection with the high head development at Jordan River, on Vancouver Island, undertaken by the Vancouver Island Power Company, a subsidiary company of the B. C. Electric Railway Company, where a 6000 h.p. Doble Impulse wheel —connected with a 4,000 kw. Allis-Chalmers-Bullock generator—was installed the first of the year. A complete description of this plant appears in the present issue of the Electrical News. It will be noted that this wheel operates under an effective head of 1100 feet, and has a number of other unique features connected with its operation. It is worthy of note that an order has now been placed with the John McDougall Caledonian Iron Works Company, Limited, of Montreal, for an exact duplicate of the above wheel and generator, together with all auxiliary machinery. The order was sent through Mr. Beard, Manager, at Vancouver for Allis-Chalmers-Bullock, Limited, B. C., representatives for the Caledonian Iron Works.

Winnipeg Operates Waterworks Electrically

The City of Winnipeg has recently completed the erection of a 13,200 volt transmission line to their new wells, about six miles from the new McPhillip street sub-station, and also the installation of step down transformers at wells 7 and 8, with all the necessary switching and protective apparatus. Power is being transmitted over this line from the city's steam turbine plant at the waterworks, the voltage being stepped up from 2,200 to 13,200 in the new sub-

station No. 2, a part of the city's new distribution system, and the first station to be completed. All the tests made have been thoroughly satisfactory, and the operation has been all that could be desired. In connection with this work a 300 kw. generator which has been lying idle in the pumping station for some time has been connected up as a synchronous condensor to correct for the low power factor of the lines supplying the induction motor driven pumps

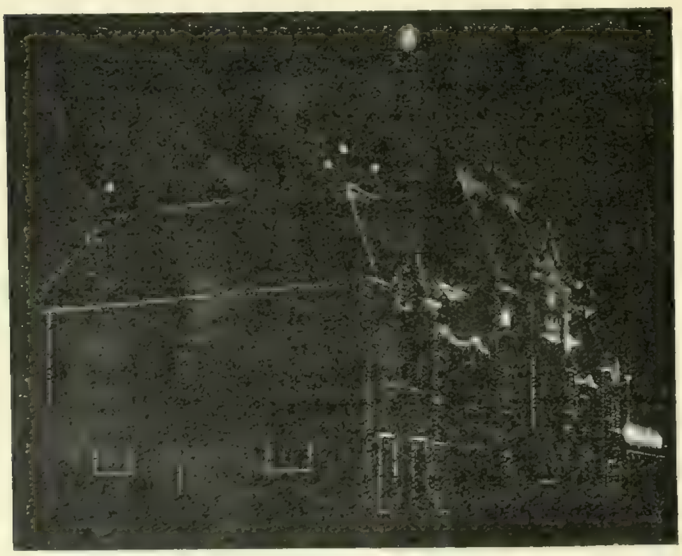
Calgary Power Company

The phenomenal growth of the city of Calgary has already necessitated the further expansion of the Calgary Power Company's plant at Horse Shoe Falls. Surveying parties have been busy marking out the route of a new transmission line to be practically a duplicate of the first line which has now been in successful operation a couple of months. The duplicate line will double the carrying capacity of the system and also insure continuity of service, as not following exactly the same course, lightning troubles which may interrupt the operation of either line would not be likely to disturb the other at the same time.

It is understood work will be rushed on this new line so as to have it completed before the severe winter weather sets in.

Coronation Illumination in St. John's, N.F.

The photographs shown herewith illustrate some of the illuminations put up by the electrical department of the



Reid Newfoundland Company of St. John's, Newfoundland for Coronation week.

The Colonial Building had 5000 lamps of which 550 amber colored in the crown, being non-actinic, did not show on the plate. The flag had 900 arranged according to the regulars; names of the colonies, etc., were "all red" and connected to the crown in the centre by lines of blue lamps. The Reid Newfoundland Company's general offices had 5500 lights.

Corner Stone Laid by Cable

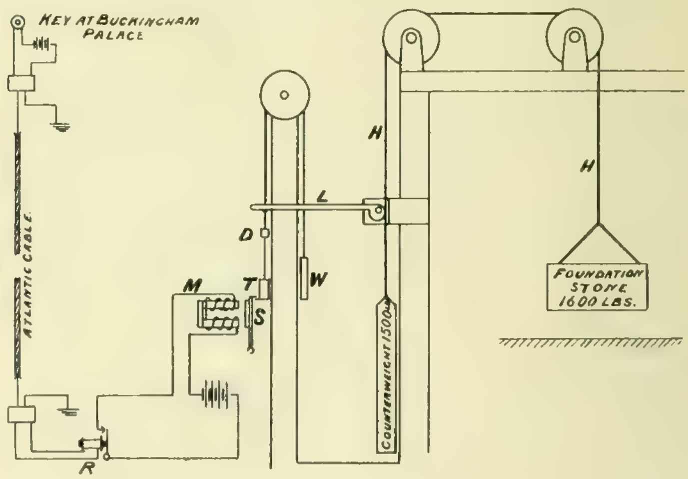
One of the events of Coronation week in St. John's, Newfoundland, was the laying of the foundation stone of the King George V. Institute by His Majesty from Buckingham Palace, his first official act after the Coronation. This is the building that is being erected, through the efforts of Dr. W. T. Grenfell, for seamen.

Arrangements had previously been made with the Anglo-American Cable Company, and the Post Office Department in London to get a clear line through from Buckingham Palace to St. John's on June 22 which would be free from any interruption from 12.15 to 12.35 on that date, as the King had graciously consented to close the key at the Palace at 4,00 p.m.

A simple apparatus was arranged at this end of the line to let the stone drop slowly to its position when the

contact was made in London. The apparatus was fixed up and connected according to the accompanying sketch.

The lines of the Anglo-American Cable Company, energized by the King, operated the cable relay R. closing magnet M. By this means the spring S was withdrawn, the trigger T released and a weight W attached to it by a rope passing over a pulley allowed to fall. This movement of W raised D, a stopper attached to the rope, against the lever arm L of an angle-iron, releasing the steel cable H to one end of which the foundation stone was attached. A counterweight a few pounds lighter than the foundation a local battery circuit which in turn operated the electro-



stone attached to the other end of the steel cable as shown, served to regulate the speed of the descent of the large corner stone, so that it fell slowly to its bed.

Cape Breton, N. S.

The installation of a briquetting plant is proceeding rapidly at Mackay mine on Cape Breton, N. S. In connection with this plant a complete electric service will be installed, power being obtained from the Cape Breton Electric Railway Company. The pole line is now being erected to connect this company's generating plant with the Mackay mine and also with the Colonial.

A Truthful Correspondent

Editor Electrical News.

When every other hypothesis fails to account for a mysterious fire the popular mind, ably aided and abetted by the daily press, hastens to deliver itself of the only bit of electrical phraseology in its vocabulary and with expanded chest exclaims "defective insulation." Once more history repeats itself in Hamilton following the fire at the asylum. It has been a foregone conclusion that defective electric wiring caused the calamity. Now it transpires that the power was off! at the time the fire started.

Yours truly,

J. U. C.

Electric Power from Rainfall

A company has been formed in India, known as the Tata Hydro-Electric Supply Company, to furnish power for industrial purposes. This power will not be derived from permanent streams, but will be gathered in reservoirs during the very heavy rainfall.

During the monsoon season, from the middle of June to the middle of September, there is a rainfall on the west coast of India that averages 175 inches at Lanouli, sometimes greatly exceeding this average.

It is planned to erect three lakes or reservoirs. The Lanouli reservoir, which will store water to be used during the three months of the monsoons, will be large enough to hold sufficient water during the longest breaks in the rain at that season. It will approximate 1,000 acres, formed by a dam 3,800 feet long and 26 feet high, and its cubic capacity will be 380,000,000 feet. The Walwhan lake is the second reservoir and is to serve for the remainder of the year. It will be situated about a mile and a half from Lanouli, and will be formed between two spurs of hills by a dam 4,500 feet long and about 68 feet high. The area of the lake will be approximately 2½ square miles, with a capacity of 2,600,000,000 cubic feet. The dam will be of solid masonry fitted with sluices. Later on it is expected that a third reservoir will be constructed beyond Walwhan lake, with which it will be connected by a tunnel nearly a mile long running through the dividing ridges of steep hills which will form a watershed some 1,200 feet above the level of the valley. This reservoir will have an area of 3,174 acres, or nearly 5 square miles, with a capacity of 7,000,000,000 cubic feet of water.

The water, traversing an aggregate distance of nearly 4 miles, will be led through masonry ducts from the lakes to the fore bay, situated 2,040 feet above sea level: Here it will enter pipes 6 feet in diameter, which will run down steep slopes and precipices to Khopoli. The head will be a little over 1,730 ft. The generating station will be at Khopoli, 300 ft. above the sea and 90 miles from Bombay, where it is planned to use the energy for manufacturing purposes. The initial installation will be for 40,000 h.p. capacity.

Montreal's Underground System

The commission, composed of Messrs. Beaudry-Leman, R. S. Kelsch and L. A. Herdt, appointed by the Montreal City Council to draw up plans for putting the overhead wires underground have started their preliminary work by asking for the necessary funds to open an office and engage a staff. In a letter to the Board of Control emphasis is laid on a clause in the by-law by which the city is authorized to call upon companies and persons to furnish such necessary information as may be asked by the city and to state what portion of the underground conduits they wish to reserve. The city is empowered to impose a fine of $25 a day on such companies as remain in default after sixty days from the date of such notification. The commissioners request the delegation to them without delay of these rights of notification as it is absolutely necessary that the members be informed of the nature and extent of the present installations, both overhead and underground, belonging to persons or companies carrying on operations in Montreal, whereby the public streets and lanes ,as well as private property are being occupied by poles, wires, conduits, pipes, tubes, etc. The commissioners desire the fullest knowledge of the position and location of gas pipes, water pipes, sewer pipes, and all other structures and devices, as this information will have an important bearing upon the design and location of the conduit system. A considerable amount of work will be necessary to obtain this, and the commission suggests that the civic departments should furnish accurate and detailed data in regard to the condition of the streets, both overhead and underground.

With regard to finances, the city has authorized an issue of five million dollars to provide for the undertaking, but the bulk of this will not be required for some years, not until, in fact, the actual construction work and expropriations have been commenced. The commissioners, however, ask for a grant of $25,000 to cover preliminary expenses, including salaries, office and staff expenditures. The commissioners will require an engineer who will devote his whole time to secure and group the necessary data for the preparation of the plans and specifications; also a secretary-treasurer, two draughtsmen, a stenographer and a general office man.

Marconi Wireless Development

The Canadian Government has decided on an important extension of the Marconi wireless service, from the Gulf of St. Lawrence to the Great Lakes, which will thus give a continuous service for many hundreds of miles.

It was in 1900 that Mr. Marconi invented his wonderful system, and in the following year succeeded in receiving signals communicated from Poldhu in Cornwall, England, at St. John's, Newfoundland. Now, the Glace Bay Transatlantic station is the most modern long distance wireless station in the world, with the exception of the Marconi station at Clifden, Ireland.

In 1903 a system of intercommunicating stations in the Gulf of St. Lawrence was started, and the system, so far as Canada is concerned, has been gradually developed since that date. These intercommunicating stations extend from Montreal, down the St. Lawrence, through the Gulf northward to the Straits of Belle Isle and Hamilton Inlet on the Labrador coast, about 150 miles north of Belle Isle; then to Cape Race, the most easterly point, and to Sable Island, Cape Sable, Halifax and St. John, and around the Nova Scotia and New Brunswick coasts. It is claimed that the services given by means of the stations is not surpassed by any other chain of intercommunicating wireless stations in the world, and, in fact, that no such other chain is in existence. The stations are primarily intended as an aid in navigation, and on this account the company receives a grant from the Dominion Government. Many of the captains whose vessels are fitted with the system have declared that they would feel quite at a loss if by any means it were withdrawn.

The chief value of the extension from the Gulf to the Great Lakes will be the assistance given to navigation. It is common knowledge that storms rise with great suddenness on the lakes, and in such an event vessels fitted with wireless would be able to communicate, not only with other

ships should a disaster occur, but would, when taking refuge in one of the many small ports, be in a position to get into touch with the owners.

That wireless telegraphy has become an important factor in life-saving may be gathered from the fact that about 3000 people owe their lives to the help rendered to vessels at sea through the agency of the system. Many governments are recognizing its value in this connection, and Great Britain, the United States, New Zealand, Austria and Italy are compelling ocean-going vessels carrying a given number of passengers to install a recognized system of wireless telegraphy. The total number of boats using the Marconi is in the neighborhood of five hundred.

Mr. Marconi is now on a visit to Canada, for the purpose of conducting, at Glace Bay, experiments by which he hopes to increase the distance over which wireless messages can be sent. If the experiments should prove successful, he says, the appliances will be a great advance on anything already in use.

During the voyage on the White Star Steamer "Laurentic" he made several experiments with a new instrument he has invented, and from the time the vessel left Liverpool until she was docked in Quebec Mr. Marconi was able to maintain communication with Poldhu, Cornwall. This is a record for transmission and receiving at sea, the distance being given as 2622 miles. Mr. Marconi is sanguine that, as the result of his experiments at Glace Bay, he will be able to reach even greater distances than was possible from the steamer.

Montreal Notes

The Canadian Fairbanks Company, Montreal, has supplied the Maniteau Club, St. Agathe, Que., with one of their special electric lighting outfits.

The members of the Montreal Electrical Association will resume their regular meetings early in September. Mr. Richard Lynch is the new secretary.

Several good contracts have recently been secured by the Wire and Cable Company. These include a large quantity of weather proof wire for the Toronto hydro-electric system; telephone cable for the Saskatchewan Government; and a complete underground power cable installation for the city of Calgary.

Mr. R. S. Kelsch, consulting engineer, of Montreal, has placed orders with the Allis-Chalmers-Bullock Company, of Montreal, for six four thousand horse power Francis turbines, governors and accessories for Price Brothers Company's, Limited, new plant at Jonquiere, Quebec. For the same firm Mr. Kelsch has ordered a steel penstock 29,000 feet long, of a total weight of over 4,000,000 lbs., from the Petroleum Iron Works Company, of Sharon, Pa. All the electrical apparatus, including two 3,000 h.p. generators, raising and lowering transformers, two large switchboards, and accessories, will be installed by the Canadian Westinghouse Company, Hamilton.

The Montreal Harbor Commissioners have just completed a new ten ton freight electric hoist, erected between the two C. P. R. sheds, on the water front. The hoist is designed to lift loaded wagons either to or from the upper sections of the sheds, and is constructed on the lines of one installed last year for the use of the Donaldson Line. This has been so successful that the commissioners decided to build a second one. The platform is 12 ft. by 30 ft. long, and is operated by a 30 horse power 550 volt induction motor of the slip ring type. The speed of the hoist is [illegible] a minute. The hoist was supplied by the Otis-Fensom Elevator Company.

Reorganization of Toronto Electric Light

At a recent meeting of the directorate of the Toronto Electric Light Company a number of changes were made in the personnel of the staff as well as of the directorate itself. Several prominent business men have withdrawn from the board, including Messrs. W. D. Matthews, H. P. Dwight, W. R. Brock, Thomas Walmsley, L. Goldman, Samuel Trees and Hugh Blain. The present board consists of Messrs. Sir Henry M. Pellatt, president; D. B. Hanna, vice-president; H. H. Macrae, 2nd vice-president; Senator Cox, R. C. Brown, R. J. Fleming, Z. A. Lash, Sir William McKenzie, Frederic Nicholls, E. R. Wood, G. A. Morrow.

Important changes were also made in the staff of the company. Mr. Macrae resigns from active management and is succeeded by Mr. R. F. Pack. Mr. Pack has been with the company for over twenty years. Latterly he has held the position of secretary and comptroller of the company and during the past few months, in Mr. Macrae's absence, has been acting manager. No man the directors could have chosen is more closely in touch with the workings of the company or more actively alive to the requirements of modern business competition.

Mr. R. F. Pack

The company sustains considerable loss in Mr. W. A. Martin, assistant general manager, who resigns to engage in the electrical manufacturing business on his own account. On the eve of Mr. Martin's departure the staff of the company met to express their regret at his decision and to present him with a reminder, in the form of a gold watch, of their united appreciation and esteem. The directors also clearly indicated their recognition of Mr. Martin's twenty-five years' invaluable work for his company by handing over a very substantial cheque.

A suggestion that action be taken to induce the United States Government to prohibit the importation of electrical energy from Windsor across the river to Detroit has been referred to the Public Policy Committee of the N. E. L. A. As is well known the Ontario Hydro-electric Commission is depending on Detroit as a field for the power it will carry along its new transmission line from St. Thomas to Windsor, without which large customer the line could scarcely be made a financial success. The project to import energy from Windsor is meeting with strenuous opposition from the operating companies in Detroit City.

The Makers of Electrical Canada—9

WILFORD PHILLIPS—MANAGER

We are apt to think of the phenomenal development of Western Canada as due entirely to "natural causes"—the tremendous resources of the soil, the golden opportunities, the vigorous climate, the "bigness" of everything material. And we are apt to forget about the big men. But, a nation's resources do not develop themselves, and successful development of an enterprise of whatever kind can only be accomplished by big men. There is no doubt that Western opportunities, of great magnitude, have been, and are yet, waiting to be grasped, but the little man can't reach them—even in the West. It takes the big "rangey" fellows, men born with the possibilities of growth in their system, men who feel stifled in an atmosphere of over-cautious or conservative methods, men who can reach away up to the opportunities most of us can see, but few dare to grasp. Such men have developed the West—while the West was developing them.

Every municipality and its public utilities are complementary to each other. The growth of a municipality depends quite as much on the efficient management and development of its public service corporations as the latter do on the progress of the municipality. The value of the individual, therefore, to a growing municipality can scarcely be over-estimated, and it may safely be advanced as axiomatic that every Canadian city that has shown extraordinary growth has been served by public utilities which were operated by extraordinary men.

There is no better example in Canada to-day of what such mutual development can accomplish than is typified by the city of Winnipeg. Twenty years ago Winnipeg was a mere speck on the Western horizon; to-day they talk of one hundred thousand as confidently as they speak of dividends in the West. It is no chance coincidence that this city possesses a street railway system second to none on the continent in roadbed, equipment and management. It is no coincidence that the city has been served by one of the most modern and dependable light and power plants in America. Neither is its rapid interurban service, nor its well-managed gas plant a matter of chance. These facts have been the very foundation on which the city and its suburbs have been built up. The debt the city of Winnipeg of to-day owes the men who have stood behind these enterprises can scarcely be over-estimated.

For the public utilities of Winnipeg have been developed to keep pace, or a little in advance, of the city's progress. Ten years ago the liabilities of the Street Railway Company scarcely exceeded two million dollars; to-day they are probably eight times that amount. Ten years ago there were eighteen miles of track; to-day it is approximately one hundred and twenty. Ten years ago fifty small motor cars comprised the rolling stock; to-day the number of modern, well-equipped, commodious coaches numbers nearly two hundred and fifty. In addition there is the big hydro-electric plant supplying light and power, the brand new steam turbine auxiliary plant to ensure continuity of service, and the thoroughly modern gas plant.

Mr. Wilford Phillips

Of course, one man didn't do all this, but there has been one man on the job all the time for the last decade, one of those fellows with "rangey" ideas, the subject of our sketch this month, the general manager of the Winnipeg Street Railway Co., Mr. Wilford Phillips. He does not advertise much so we scarcely know how much credit to give him, but it is worthy of note that during his ten years' management of the system it has increased, in every department, ten fold.

Down in Prince Edward County, Ontario, they are proud to tell you Wilford Phillips was born there. That was in 1858; October 8, to be exact. In 1890 he commenced his street railway career on the Metropolitan Street Railway of North Toronto, thus showing his adaptability for and his faith in electric traction by attaching himself to what was practically the first trolley system in Canada. He was engineer and superintendent of North Toronto Waterworks and electric light in 1892 and was later appointed mechanical and electrical engineer of the Niagara Falls Park & River Railway. In 1896 he became manager of this road, resigning in 1890 to accept the office he still holds.

It is men like Wilford Phillips who have made the West, and Electrical Canada is fortunate that he threw in his lot with her.

J. A. McEachren, formerly with the Engineering Equipment & Supply Company is now conducting business under his own name, at 147 Bannantyne avenue, Winnipeg. Mr. McEachren has taken over several agencies.

Mr. William Bennett, engineer, father of Mr. James Bennett, chief electrical inspector for the Canadian Fire Underwriters' Association recently died at the Western Hospital, Montreal, after a short illness. He was 61 years of age, and leaves a widow and one son.

Bird's Eye View of Power House, Forebay and Tailrace—Canadian Light & Power Co., St. Timothee, Que.

Canadian Light and Power Development

At St. Timothee, Que., on the Beauharnois Canal — Present Equipment Three 5,000 kv. a. Units—Ultimate Capacity 75,000 h.p.

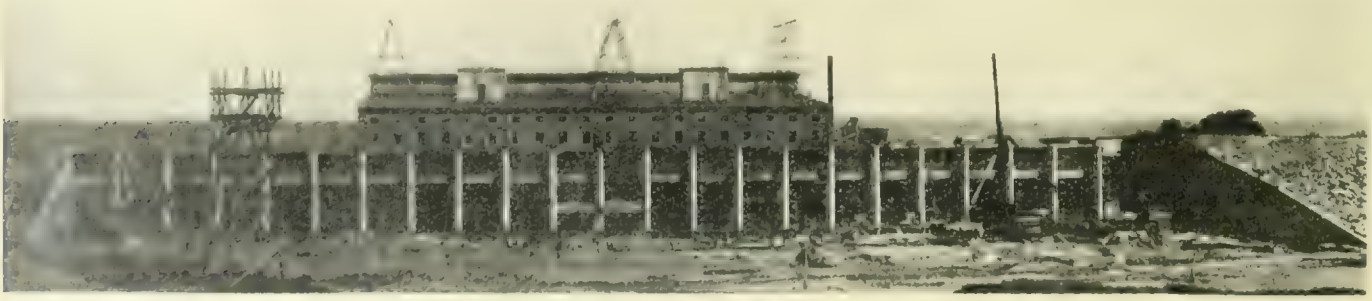
The scheme of the Canadian Light and Power Company's hydro-electric development is simple and consists of most of the usual features in power plants operating under medium heads. These are:—the canal intake with controlling gates, power canal, forebay, power house intake and penstocks, power house with its equipment, tailrace and the transmission line to Montreal with a terminal station at Montreal. The only usual feature not included is a dam which in this case is provided by the natural barrier of the crest of the Coteau rapids.

The canal intake is located at Valleyfield and admits water directly from Lake St. Francis into the power system. The flow is controlled by steel tainter gates, 20 ft. x 20 ft., operated by an electric travelling hoist. Of these steel gates there are now four in place, but provision is being made for two additional gates which can be erected at any time without interruption to power operation. There is also included in the intake a boat gate which will admit into the canal, boats 50 feet wide with 22 feet draft.

The power canal is that part of the old Beauharnois canal lying between Valleyfield and St. Timothee, a section seven miles long. This canal was originally only fourteen feet deep but is now being given a depth of twenty-five feet; the extra depth will insure that at no time during navigation will the flow of water through the canal exceed two miles per hour.

A large forebay leads from the end of the improved power canal to the power house located on the banks of the St. Lawrence river; this forebay is formed by means of two parallel earth dams or embankments 700 feet apart, 40 feet high and each about 2,000 feet long. They are constructed of earth made up of a stiff clay on the inside or water side and with coarser material on the outside. The banks are 16 feet wide on top which is 6 feet above the highest water, while the slopes are two on one on each side; the inner side is protected with stone riprap. The forebay headwall and tailrace are now completed for a development of about 75,000 horse power.

At the lower end of the forebay a large concrete dam or headwall provides for the intakes through which the water from the forebay is conveyed to the turbines in the power house. The dam consists of a series of twenty-two bays, each pair of which connects through openings leading directly into a main penstock. Each half opening is



Rear View, Intake and Controlling Works—Canadian Light & Power Co., St. Timothee, Que.

controlled by a large timber gate which will operate entirely under water, so as to avoid ice interference, and will be raised from below by a travelling hoist. Large racks are also located in each bay and means are provided for cutting off water from both racks and gates by stop logs.

The water leaves the turbines through draft tubes into the tailrace, a fan shaped area of 1,000 feet wide, 500 feet long and 9 feet in depth ending in the river.

The power house adjoins the headwall, but at present is constructed to provide for four (4) units only, or about 30,000 horse power, with false walls ready for extension. It is constructed entirely of stone, concrete and steel. All interior partitions are of steel hy-rib and cement plaster. Separate railway tracks run from the main siding into the generator and turbine rooms from which the large travelling cranes operating in each of these two rooms can lift materials and machinery directly from the cars.

Tainter Gates, Canal Intake and Controlling Works

The Hydraulic Apparatus

The hydraulic equipment consists of steel penstocks 14 feet in diameter, leading from the headwall into large vertical steel tanks 27 feet in diameter open at the top. These open tanks provide for any surges in the water level caused by sudden changes in operating conditions. In each tank are placed two 72-inch turbines on a single shaft, each pair developing, under 50 feet head, about 7500 horse power at a speed of 150 revolutions per minute. One important feature of this equipment is that the entire weight of the turbines and their water load is carried on two bearings located outside the tank, so that they are easily accessible to the operator. Lombard governors, type N14, regulate the turbine gates and are designed in times of emergency to close the gates completely in three seconds. The turbines are S. Morgan Smith manufacture.

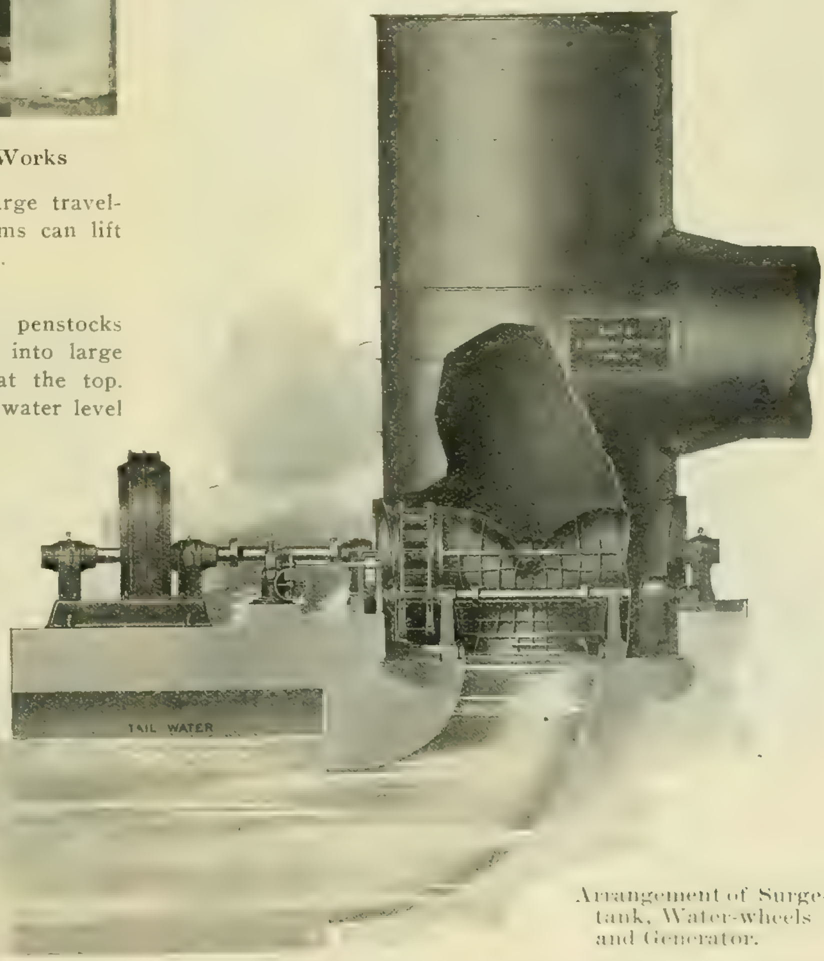
Electrical Power House Equipment

The electrical equipment of the power house follows the latest standard practice, that of complete individual units, consisting of low tension generator, switching apparatus and step-up transformers running in parallel on a high tension bus, with provisions for transforming the low tension energy of any one unit to the high tension bus through any other unit. This first development will consist of ten of these complete units.

The present generating equipment consists of three 5,000 kv.a. Allis-Chalmers-Bullock 3-phase, 2,300 volt, 60-cycle, 150 r.p.m. alternating current generators. The bearings of both the water wheels and generators are lubricated by oil under pressure and cooled by means of circulating water taken from the forebay. The current passes from the generators through a low tension automatic solenoid-operated oil switch to a short bus from which it can be delivered through another oil switch to the transformer or the auxiliary bus.

The transformers, four in number, are 5,000 kv.a capacity, three phase, delta to delta, oil insulated and water cooled; they step the potential up to 48,000 volts for transmitting; each transformer is provided with an emergency oil drain leading to the tailrace and is placed in a concrete compartment, thus giving complete protection in case of fire.

The exciter plant consists of two water wheel driven 250 kilowatt d.c. machines operating in parallel. A booster is inserted in the main exciting circuit so that the operator, once having adjusted his alternating current generator field rheostats by working in the field of the booster, is enabled to control the voltage of all the generators at once. A storage battery automatically replaces the exciters, should they drop their voltage, thus eliminating a shut down. All switch gear, water-wheel governors and generators are electrically controlled from a glass enclosed switchboard gallery located on the south side in the centre of the generating room. Here are the direct current exciter and battery panels, the relay panels on which are mounted the instantaneous and time element relays which automatically open the oil switches on overload and so



Arrangement of Surge-tank, Water-wheels and Generator.

protect the station apparatus from injury. On this panel are also fitted testing jacks for the purpose of testing out meters, relays, instrument transformers, etc., so by plugging in standardizing meters, tests can be made without interruption while the plant is in operation.

On the bench board control desk is traced a mimic diagram of the main alternating current circuits from the generators to the outgoing lines, small switches are mounted in locations corresponding to the oil switch they control, and by means of small red and green signal lamps, showing whether the switch is on or off, it can be determined at a glance just what apparatus is alive or dead. Above the bench board facing the operator is the instrument rack carrying the various instruments.

Westinghouse "GA" oil circuit-breakers are used in the high tension circuits. Each pole is deeply immersed in oil contained in a separate boiler plate tank of its own. All terminal bushings are of the condenser type with a series transformer let in and around the bushing where it enters the top of the tank. This breaker is capable of interrupting 70,000 kw. without injury to itself.

As the work draws nearer completion it is seen on all sides that no expense has been spared to ensure efficient operation and a high reliability factor against interruption of service.

Transmission Equipment

The transmission line, 26 miles in length, leads from the power house over a 106 ft. wide private right of way to the Beauharnois Canal, thence along the north bank of the canal to Melocheville, where it turns sharply towards the New York Central Railway and runs thence along the railway to a point just below the Canadian Pacific Railway bridge over the St. Lawrence river. The transmission line is carried across the river in two spans of 1,700 feet, the central support being on a steel tower supported by heavy concrete piers built down to the river bed. The line runs thence to the Lachine Canal at Rockfield following the north bank to Cote St. Paul where it ends in the terminal

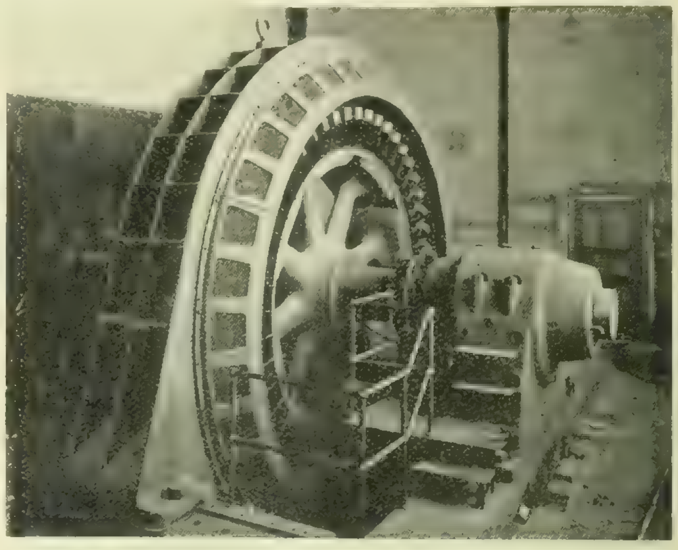
One Pair 7,000 h.p. Turbines—Canadian Light & Power Co.

station. The towers, which are of galvanized structural steel, spaced about every 500 feet, are liberally designed to carry two three-phase circuits of No. 00 copper wire made up in nineteen strands. Also a telephone circuit of two No. 5 copper clad wires and a single No. 4 copper clad ground wire located on top of the towers—this grounded line acting as additional lightning protection to the electrolytic arresters located at each end of the transmission line.

The two main transmission circuits, capable of transmitting 20,000 h.p. each at a potential of 48,000 volts, are supported on high tension pin type Locke porcelain insulators designed to stand a precipitation test for thirty minutes at 120,000 volts.

Both Telephone and Telegraph System

Special attention has been given to the methods of communication between the power house and the terminal station consisting of a combined telephone and telegraph system. The telephone equipment consists of a special telephone set having all metal parts arranged to be grounded, insulating transformer, extension bell, drainage coil, etc.



One of main Generator Units—Canadian Light & Power Co.

Condensers are inserted in the telephone circuit to prevent the direct current from the telegraph equipment passing through the telephone apparatus. The condensers are provided with double pole, double throw knife switches so that if they are damaged they can be readily cut out and the line kept closed. A voltage protector is connected to the instrument side of the insulating transformer to discharge any static caused by disturbances on the line side.

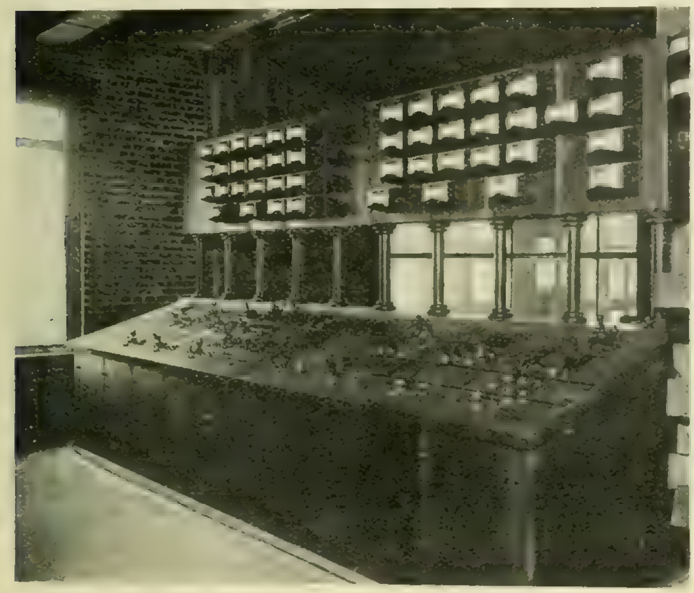
The telegraph equipment consists of a retardation coil, line relay, key, line battery, sounder, local battery, etc., the telegraph instruments being connected between the neutral of the retardation coil and the ground so that the telegraph current will, in normal operation, divide and flow in equal amounts over each of the two line wires. If one of the line wires is broken or grounded, it can be cut out by means of the switches provided and communication carried on over the remaining sound wire.

All the equipment has been so arranged that it is readily accessible thereby permitting repairs and changes to be quickly made.

The Terminal Station

The terminal station at the end of the transmission line is located at Montreal near the bridge over the Lachine Canal at Cote St. Paul. It is a fireproof structure 250 ft. long by 50 ft. wide, composed of steel and concrete enclosed in red pressed brick, faced with Indiana limestone. The two incoming lines enter the west end wall and drop down to the line oil switches; just outside the terminal station are located the horn gaps used in conjunction with the electrolytic lightning arresters which are placed on a gallery just inside the buildings. The two lines run the entire length of the transformer room. An oil switch located next to the line switches enables these high tension busses to be tied in. Placed under the high tension busses, three on each side, are the instrument series transformers and oil-insulated, water cooled, three-phase General Electric

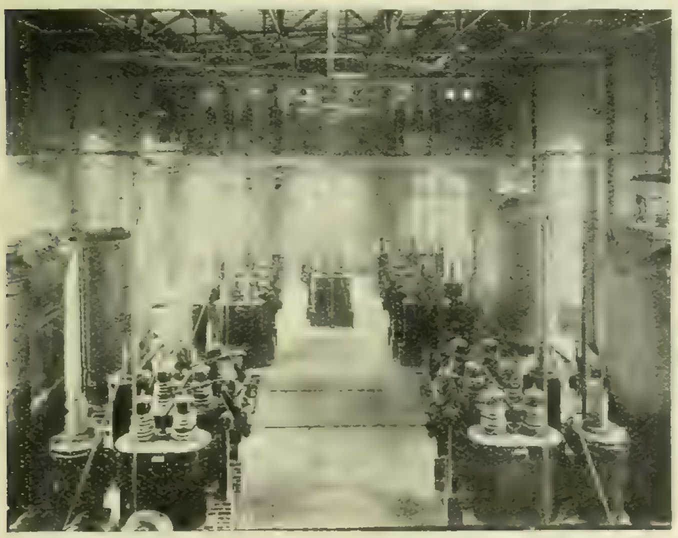
transformers, of 4000 kv.a. capacity, which lower the potential to 13000 volts for distribution. All the oil switches in this room are K10 solenoid operated, can be isolated by disconnecting switches and are controlled from the switchboard gallery. The transformer low tension leads run along under the floor in fibre conduit encased in concrete, to the switch room where after rising through a motor operated, type H, oil switch, each lead rises vertic-



Main Switchboard, Terminal Station, Montreal

ally in a brick compartment to the lower poles of two disconnecting switches through which the transformer can be thrown on to the main bus or an auxiliary bus. On the top floor of this house are the motor operated oil switches and lightning arresters for the outgoing feeders.

All disconnecting switches in this house are so arranged that when closed they light a signal lamp on the switchboard and light a red lamp placed over the corresponding set of switches, thus giving protection against opening disconnecting switches under load.



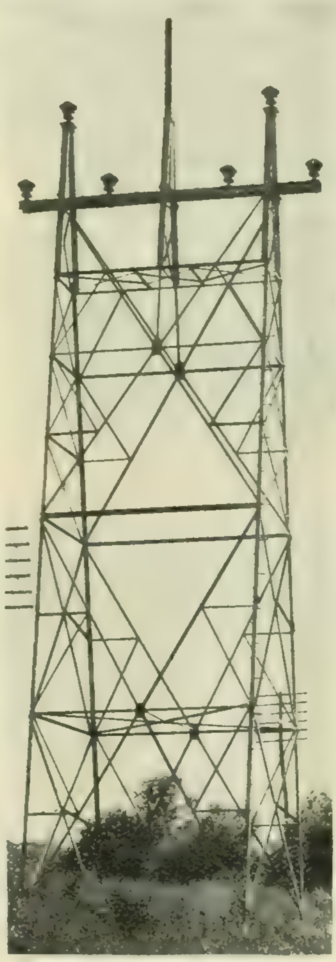
Transformer Room, Terminal Station, Montreal

Auxiliary Steam Plant

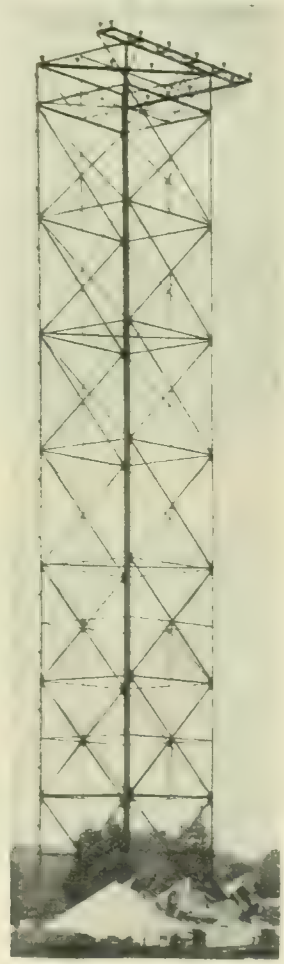
In the next section is the emergency steam plant consisting at present of one 1500 kw. 2300 volt, alternating current turbo-generator and auxiliaries. The energy of this generator is raised to 13,000 volts by a 1875 kv. a. oil-insulated, water-cooled, three-phase transformer and connected to the 13,000 volt busses through motor operated oil switches located in the switch house next to the transformer switches.

Next comes the boiler room which contains four B & W marine type water tube boilers of 333 horse power each, placed in two pairs on each side of the firing aisle. The coal is stored in a long concrete pocket sunk under the siding of the G. T. R. and from there is carried by a coal conveyor after being crushed and weighed, to the overhead bunkers from which it is fed down to the chain grate stokers. Special fuel oil burners are installed which in emergency will bring the boilers up to full pressure in twenty minutes.

The switchboard gallery, a glass enclosed structure, overlooks the turbine room and contains the direct current panels for the turbo exciter and control circuits, the relay board which holds the overload and time element relays and jacks for insertion of standardizing instruments



Typical Transmission Tower



Special Tower, crossing Lachine Canal

to test all relay circuits, instrument transformers, etc., the bench board control desk and instrument rack mounted on front of same. As at the power house, a complete diagram of the main circuits is given in miniature on the bench board, enabling the operator to see just what path the energy is taking from the incoming lines to the outgoing feeders. The synchronizing receptacles on this board are arranged so that the oil switch connecting the turbo generator to the 13,000 volt bus cannot be thrown in unless the synchronizing plug is in.

Another B. C. Hydro-Electric Development

Jordan River Plant Ready to Operate—Transmits to Victoria City — Two 6,000 H. P. Units at First — Head of 1,100 Ft.

The Vancouver Island Power Company, a subsidary company of the British Columbia Electric Railway Company Limited, is now carrying out a large electric power development scheme on the Jordan River, located in the southeast portion of Vancouver Island, British Columbia, literally at the western outpost of the British Empire. At the expenditure of several millions of dollars the company plans to deliver from its hydro-electric plant on the Jordan River 24,000 horse power of electrical energy at the substation in Victoria, the capital of British Columbia, where the company operates a tram system covering the city and suburbs and carries on a general light and power business. The heavy expenditure involved in carrying out the development work is necessitated by the growth of the company's business on Vancouver Island as well as to provide power for the operation of an interurban tramline, 22 miles in length, running north from Victoria through the Saanich peninsula, work on which is now under way.

Power House—Vancouver Island Power Co.

Operations on the Jordan River plant have been in progress for some time and the company is now about ready to supply the initial energy form a station equipped to provide 6000 h.p., with considerable progress already made on another unit of the same power. It is expected that these two units will be sufficient to meet the company's demands for two or three years, during which time steps will be taken to enlarge the power plant and develop the ultimate capacity of 24,000 horse power through the installation of two additional units of 6000 h.p. each.

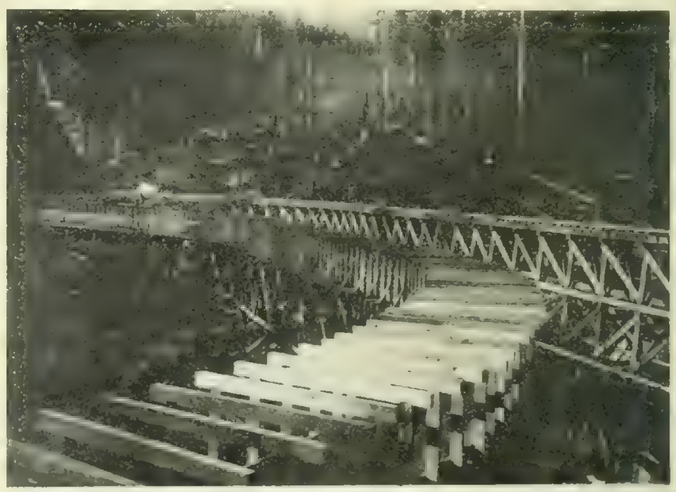
The principal features of the development work are the damming of Bear Creek, a tributary of the Jordan River; the construction of a diversion dam at a point lower down the river; the building of a flume six miles in length; the construction of a forebay reservoir at an elevation of 1150 feet above the power house site; placing a two mile steel pipe line for conducting the water from the reservoir to the power house; building a power house; installation of hydro-electric equipment and, finally, constructing a transmission line forty miles in length to carry the electrical power to the substation at Victoria.

The Jordan river is a stream flowing into the Straits of Fuca, on the coast of Vancouver Island, about 40 miles west of Victoria. Its drainage area is approximately 74 sq. miles, the greater part of the watershed being at an elevation of over 1,200 feet and well wooded. The average precipitation for the section during 1908 and 1909 was 75 inches. The records of the flow of the streams show that to meet the power requirements of the company for the future it will be necessary to store water and with this idea in mind sites have been already selected for five reservoirs, work on which will be carried out as the needs of the case demand.

The reservoir site on Bear Creek is about a mile from the junction of the creek with the Jordan and eleven miles from the beach. Here has been constructed a hydraulic fill dam 50 feet in height. This will impound about 300,000,000 cu. ft. of water, ample to supply any deficiency of the natural stream in meeting the company's present requirements. The dam is 725 feet long at the crest, has a width at top of 10 feet; water slope of 2½ to 1 and dry slope of 2 to 1; volume of earth to be placed, about 120,000 cubic yards; flowage area of storage basin, about 270 acres.

As the demands upon the company for power increase and additional units are installed at the power house this dam will be raised to a height of 70 feet, increasing its impounding capacity to 500,000,000 cu. ft. and the area of its basin to 400 acres. The crest of the dam will then be 1220 feet in length and 200,000 cu. yds. of earth will be required for the additional filling.

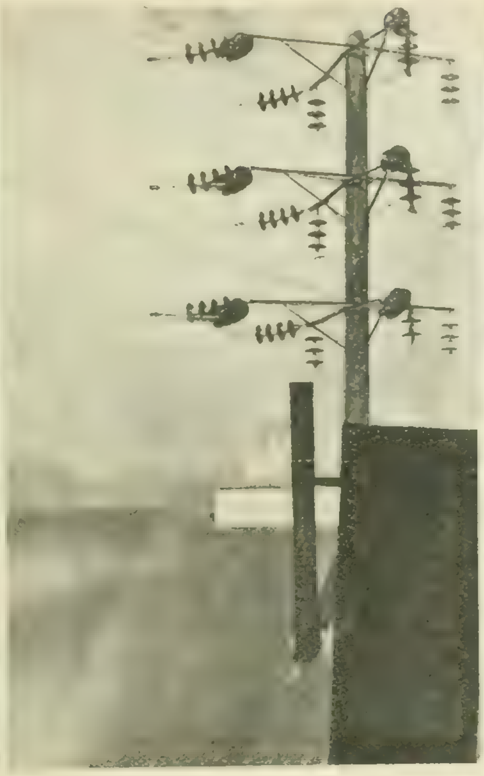
The diversion dam is located on the Jordan river at a point about eight miles from its mouth. This dam is constructed of timber crib work, back filled with stone and with a plank facing both up and down stream. Its height is only sufficient to meet the requirements of the case. The intake basin is sufficient to provide for the company's ultimate plans for power and the usual rack bars are installed to prevent floating debris passing into the flume.



Flume and Flume Railway—Vancouver Island Power Co.

From the diversion dam the water is conducted by a timber flume, six miles in length, to the forebay reservoir, the fall being about five feet to the mile. The flume is of the two post rectangular box type, providing for a box

34-inch Pipe Line.



Transmission Line at Victoria Sub-station.

Forebay Reservoir Gate-tower.

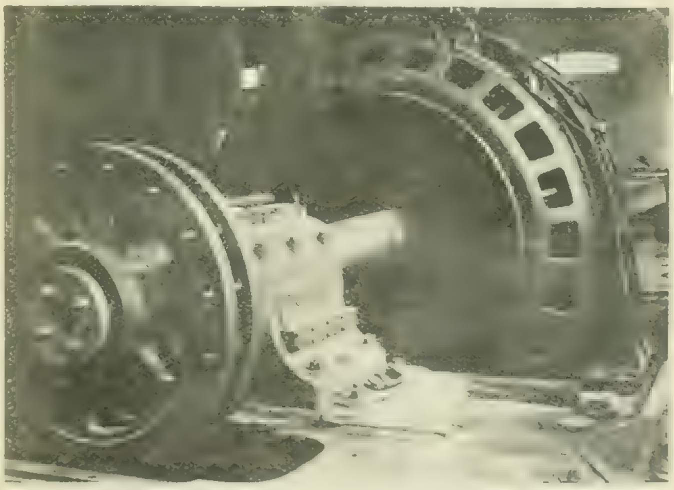
five feet by six feet in section. Initially the flume has not been made of the full height but when the full plans are carried out it will deliver 164 cubic feet per second, a sufficient supply to operate the three generating units planned for the power house at their normal load and a fourth unit as it may be required to meet exceptional demands. The usual safeguards of sand boxes and waste gates have been installed in the flume.

From the flume the waters of the Jordan emerge into forebay reservoir, located 1,150 feet above sea level. The ultimate plans for this reservoir contemplate the erction of dams closing up two small valleys and impounding about 4,370,000 cubic feet of water. For the present, however, only a low dam has been constructed, sufficient to meet immediate needs. The height of this dam is about 21 feet, and 10,000 cubic feet of earth fill was used in its construction.

From the forebay reservoir the water is conducted to the power house, two miles distant, through steel pipes For the first third of the distance a single rivetted steel pipe, 44 inches in diameter, is used, which will carry sufficient water for the first two units as planned for the power house. For the remaining two-thirds of the distance the water is conveyed through two lap welded steel pipes ranging from 36 to 30 inches in diameter, this section of the connection being jointed with the 44-inch pipe by a cast iron "Y." When the final plans for the dams at the forebay reservoir are carried out another 44-inch pipe will be placed in the dam and provision thus made for supplying water for the third and fourth units at the power house.

The power house is located at about sea level. The initial building is about 50 by 100 feet in size, being designed to accommodate two units of 6,000 h.p. each with necessary transformers, switchboards, etc. The structure is built of concrete and steel and in its design was arranged to allow for extensions at a future date when additional units are demanded.

The generating machinery now installed in the power house and about ready for operation, consists of one 6,000 h.p. waterwheel of the Doble type, manufactured by the John McDougall Caledonian Iron Works; one 4,000 kw. Allis-Chalmers alternating generator, exciter generator of interpolar type, switchboard, etc. The current delivered by the main generator at 2,300 volts is stepped up to 35,000 volts by a set of three 1,400 kw. oil-insulated water-cooled transformers which are located in fireproof compartments back of the generator. This initial voltage will probably be raised to 60,000 when a second unit is placed in operation at the plant. A 75,000 volt three-pole oil switch with disconnecting switches is provided for the set of transformers and a complete equipment of three-phase aluminum cell, 35,000 volt, lightning arresters is installed to protect either end of the transmission line.



Main Generator and Water Wheel—Jordan River.

From the power house the current is carried to the sub-station in Victoria, which has been enlarged to meet the need. This calls for a transmission line of forty miles in length. For the line cedar poles are used, fifty to sixty

feet in length and spaced from 200 to 300 feet apart. Three steel cross arms are mounted on each pole, each arm being nine feet in length and braced with three-quarter inch struts. This installation provides for an ultimate installation of two three-phase transmission circuits. The suspension type of insulators are used, the brown glazed porcelain insulators being 14 inches in diameter at the bottom of the bell. The conductor is a seven-strand aluminum cable of No. 00 B and S gauge which will conduct the output of one generator at 35,000 volts with a loss of four per cent. and the output of two generators at 60,000 volts with a loss of three per cent.

Over 2,000 Foot Head in Penticton

One of the most interesting hydro-electric plants of recent years will be that for the Municipality of Penticton, B. C., tenders for which have just been called.

The water will be taken from the hills to the east of the town by about eight miles of concrete gravity conduit at the end of which it will discharge into two twelve-inch pressure pipe lines, one of which will be installed at present. The twelve-inch pipe is carried about one mile when it discharges into a ten inch pipe also about one mile long, which terminates in the header at the power house. Two one hundred kilovolt ampere, four thousand volt, three phase, sixty cycle, nine hundred r.p.m. alternators, with direct connected impulse wheels and exciters and a three panel switchboard will constitute the power house equipment.

The power house building will be of reinforced concrete construction with provision made in the design for future extension to the ultimate capacity of nine hundred kilowatts. A hand operated crane will form part of the later installation.

One notable feature of this plant will be the pressure under which the wheels will operate, the static head being two thousand one hundred and fifteen feet while the calculated effective head will be two thousand and forty-five feet.

The location of the power house being somewhat more than four miles from the centre of distribution four thousand four hundred volts will be the distributing pressure. The secondary distribution will be two wire 110 volt.

From the power house to the outskirts of the town a single pole line will be provided, spans of which will be about five hundred feet. A private telephone line will also be installed on the transmission poles about six feet below the transmission lines.

The street lighting system will be series tungsten with goose neck brackets, the light being distributed in many small units rather than by a few larger ones such as arc lights. Mr. F. H. Latimer, C. E., of Penticton is consulting engineer for the municipality and has associated with him for the power house and distribution system Messrs. Mather, Yuill & Company of Vancouver.

Penticton has entered upon a new era of prosperity with the commencement of construction of the Kettle Valley Railway, contracts for the first forty miles of which have recently been signed. The situation of the town at the lower end of Okanagan Lake will make it an important distributing point when the rail connection with the boundary country has been completed.

The Robb Engineering Company, Amherst, Nova Scotia, and South Framingham, Mass., have recently received an order from the Sturgeon Lake Development Company, of Toronto, for two Robb-Mumford boilers, 54 in. by 18 ft., and one stack 48 in. in diameter and 80 feet high, with smoke connection.

Vancouver Notes

City Electrician McCrossan, of Vancouver, estimates that the installation of ornamental lighting standards on Hastings street east, Cordova street and Main street, similar to those now being erected on Hastings street, will mean a total expenditure of about $50,000. The work is to be done on the local improvement initiative principle, the city paying one-quarter of the light maintenance of the standards, while the property owners are expected to pay the other three-quarters of the cost, as well as the entire expense of installation. The Hastings street system, from Granville to Main street, will soon be ready for the current, but that part of Hastings street east from Main to Jackson street, which was only recently included, Main street from Alexander street to the bridge; and Cordova street between Granville and Main streets, will not be served by the new lights, until about Christmas. The new standards will undoubtedly add greatly to the night appearance of the streets mentioned.

The British Columbia Electric Railway Company has added three new locomotives to their local equipment. One 30-ton freight locomotive was turned out of the company's New Westminster shops, the others being 45-ton Baldwin Westinghouse locomotives similar to those designed for use in the Detroit-Windsor tunnel. They possess all steel 36-inch driving wheels, and each locomotive is equipped with four 125 h.p. motors. They have an electro-pneumatic control system, which gives three running speeds, and the two engines are built so that they may be coupled in one unit in case of necessity.

The city power plant at Revelstoke was put out of business on July 25th, during the progress of a severe electric storm. Lightning struck the power line, and passing through the arrester to the armature coils of the new plant, it completely destroyed nine of them. It was some days before the damage could be repaired, and in the meantime the old gas plant was got into operation in order to provide the citizens with light.

No less than four different concerns are at present applying for permission to use the streets of Mission City, B.C., for the erection of power transmission and other lines. The companies interested are the British Columbia Electric Railway Company, the B. C. Telephone Company, the Western Canada Power Company, and the Mission City Water, Light and Power Company, all of which are installing, or preparing to install, lines.

The marriage took place at Christ church, Vancouver, B. C., on Thursday, August 3rd, of Mr. E. J. Haughton, District Superintendent of Government Works stations, Victoria, to May Esther, youngest daughter of Mr. Thos. Shotbolt, of the same city. Mr. and Mrs. Haughton will reside at Oak Bay, Victoria.

A Useful Souvenir

The Canadian Tungsten Lamp Company is distributing a very useful souvenir in the form of a letter and stamp moistener. It will be found especially useful in moistening long rolls of stamps and furnishes an additional reason why the Dominion Government should make all haste in issuing stamps in rolls as urged by the Canadian Electrical Association recently. This souvenir was widely distributed at the C. E. A. convention at Niagara Falls.

One of the Double-Truck, 46-Foot, Electric Cars of Regina's New Street Car System.

Electric Railway Progress

Regina Street Car System—Modern Equipment for a Modern City

Interest has been aroused in Canadian street railway circles by the introduction of a distinctly new element into the Canadian field of competition, viz.: English street cars. Through the enterprise of the Canada Ford Company, Limited, of Montreal and Winnipeg, the city of Regina is installing street cars manufactured at Loughborough, England, where are situated the works of the Brush Electrical Engineering Company, Limited.

These are the first street cars turned out complete in every respect in England to be imported into this country, and they are built along the lines of the standard Canadian specification. They are of the style commonly known as the semi-convertible pay-as-you-enter type and arranged for single end control. They have double sash windows which drop into boxes at the sides of the cars. The ceilings are of the monitor type with ventilating windows on each side. The vestibules at each end of the car are fitted with automatic folding doors.

Interior Regina Municipal Street Car.

The single truck cars are 33 feet in length, double truck cars 46 feet. The single truck cars will accommodate 32 passengers, while the double truck carriages will hold 44 persons. The cars are shown in the accompanying illustrations.

With regard to the interior finish, mahogany stands out prominently, the ceilings being bird's-eye maple. The blinds

Rear-end View Regina P.A.Y.E. Car.

are provided with special pinch handle releases. The seats are of the standard type crosswise with an aisle down the centre, so that two persons can sit side by side. Winter windows are also provided on the outside of the cars so that they will be free from draughts in cold weather. Specially made electric heaters are supplied for winter use in addition to track cleaners under the cars. Single truck cars

are mounted on the Brush 21 F type, 8-foot wheel bear trucks and fitted with two of their 1204 E. type, forty h.p. motors. The double truck cars are mounted on two equal wheel bogies of Brush standard type fitted with single bolsters, wheels based to be 4 ft. 6 in. with four 1204 E. type, 40 h.p. motors. These cars were ordered in the spring of this year and already have been delivered, constituting what is claimed as a record in the street car world.

Moose Jaw Electric Railway — Operated by Diesel Engines—First-Class Roadbed and Equipment

Up to the present time the Moose Jaw Electric Railway Company have received six coaches from the Ottawa Car Company. These cars are each equipped with two forty horse power Westinghouse motors, 600 volt, crosswise seats, with exit at front, and are said to be a beautiful example of this type of car, being finished in cherry and bird's-eye maple. The cut shown was taken in front of the residence of Sir Wilfrid Laurier, in Ottawa, when the car was undergoing its initial test run before being shipped west. The group standing near the car are, from right to left: Messrs. Warren Y. Soper, vice-president Ottawa Electric Railway; F. W. Lee, shareholder of the Moose Jaw Electric Railway; Franklin Ahearn, director Moose Jaw Electric Railway Company; A. A. Dion, president Moose Jaw Electric Railway Company; E. J. Daly, solicitor of the company; Lt.-Col. D. R. Street, secretary-treasurer Moose Jaw Electric Railway Company, and Thomas Ahearn, president of the Ottawa Electric Railway Company, and shareholder of the Moose Jaw Electric Railway Company.

The company are expecting to be ready to operate cars about August 15. They are building very large and beautiful car barns and power house, and installing two units of the Diesel Oil Engines, direct connected to two Westinghouse generators, each being 125 kw. capacity. In the near future seven miles of track will be in operation. This company was one of the first to decide upon using the Diesel Oil Engines, and Mr. A. Hector Dion, the superintendent of the company, states that every day makes them more satisfied that they have made no mistake, as the engines appear to be of the highest examples of machine work that have come under his observation.

One of six Coaches already Supplied the Moose Jaw Electric Railway Co.

Parlor Car Service of the Illinois Traction System

Five new chair cars for service on the Illinois Traction Company's system have just been turned out of the shop of the Danville Car Company. The new parlor car service has been instituted between Danville and Springfield; Peoria, Bloomington and Decatur; Peoria, Springfield, and St. Louis. It is believed this service will attract much of the high class traffic hitherto obtained by the parlor cars of the competing steam roads. Cleanliness in transit is a factor of very great importance.

Interior I. T. S. Parlor Car.

The cars are trailers, 55½ ft. long by 9½ ft. wide, of semi-steel construction, turtle back roof type, fitted with Illinois Traction standard ventilators and M.C.B. wheels, trucks and couplers. The accompanying photograph gives a general idea of the interior appearance of the car. The arrangement of the lights along the side of the roof is admirably adapted for reading purposes. Apparently nothing has been omitted that would add to the pleasure and comfort of the company's patrons.

Surveys have been made for the Stratford Street Railway Company, by Mr. W. S. Brooke, consulting engineer, Toronto, for fourteen miles of line in the city of Stratford. It is possible work may begin this year and that the road will ultimately connect with St. Mary's and Lake Erie.

Canadian Telephone News

New Brunswick Telephone Company's rates Approved by Commission

The public Utilities Commission of New Brunswick has just handed down its decision in the matter of the complaint of the Board of Trade of St. John city against the rates charged by the New Brunswick Telephone Company in that city. The Commission finds that the rates of the company are reasonable and just.

It will be remembered that this matter has been under discussion for several months. The Utilities Commission spent several weeks taking evidence offered by both sides. It was claimed by the Board of Trade that in comparison with other parts of the province St. John city was not being fairly treated by the company in the matter of rates. In defence the company claimed that it would be unjust to the rest of the system to separate St. John city and give special rates there. It was pointed out that while the city of St. John did actually show a fair profit on investment yet the whole income of the system of the company did not work out so favorably.

The commission finds that it would be unfair to dissociate St. John city from the rest of the system and concludes that the rates charged are neither unjust, unreasonable, nor discriminatory. One exception only is taken to their rates, namely, the annual charge of $12 for what is known as the extension set or desk telephone. The company argued that this, being in the form of a luxury, should be well paid for by the customer, but the commission believed that the rate charged should bear a reasonable proportion to the value of the service rendered and they reduce this charge to one half.

The following are the rates charged in St. John, the figures being for yearly rental charges for local service only:

	Business	Residence
Special line	$45.00	$30.00
Two party	40.00	24.00
Four party	35.00	20.00
Eight party	none	18.00

Desk equipment $2.00 extra. Flexiphone $4.00 extra.

The value of the New Brunswick Telephone Company's investment as shown in the annual report of March 31st, 1911, is as follows:—

Plant, $1,248,409.63; real estate and buildings, $78,503,-17; Miscellaneous equipment, $7,523.64; Supplies, $36,915,-04; a total of $1,407,351.48.

Alberta Telephone Expansion

The telephone system of Alberta under government control, is making excellent progress. There are now close upon 12,000 subscribers in the Province, the cities and towns having about three-fourths of these. By the end of the present year there will have been constructed about 4000 miles of long distance line and about 3000 miles of rural line making a total of 7000 miles exclusive of the lines in the cities and towns. A new line has just been completed between Edmonton and Calgary which will be used exclusively for calls between the two cities. This line can also be used to carry telegraph messages but will probably be utilized to the extent of making ready for the next customer while a conversation is still going on. In a short time construction will have been completed which will give a proper service between Edmonton, Calgary, Lethbridge, Medicine Hat and all intervening points thus tying together the two provinces of Saskatchewan and Alberta. The Government is installing a new switchboard in Strathcona.

While the expansion in the telephone system throughout the whole province has been remarkable, extensions in rural districts have been the most noticeable. During 1910 over 1400 miles of rural line were set up reaching an average of about one farmer per mile. During the present year it is estimated that 1500 miles will have been erected before winter sets in. Throughout the working season the government installation gang numbers about 200 men.

The system used in Edmonton and now being installed in the new exchange in Strathcona is the automatic type. The work of installation is in charge of Mr. Kerby of the Automatic Telephone Company, of Chicago, the firm which is supplying the equipment.

Rimouski Not Behind in Telephone Facilities

The business interests of the Rimouski section are unusually well provided with an up-to-date telephone service, one company operating the entire system from Levis to Campbellton, just inside the New Brunswick border, a distance of over 300 miles. The rates are reasonable and the line is well patronized, many of the poorer classes being numbered among the subscribers. An unlimited service is furnished to business houses for $20 and to private residences for $15 a year. This includes connections within the township during the entire day and the adjoining townships after 6 p.m. A discount of 50 per cent. is made from the long-distance tariff to subscribers.

Montreal Will Prepare Evidence

If a recommendation of Mr. J. L. Archambault, City Attorney, of Montreal, is accepted, the special committee on telephones will engage Mr. Francis Dagger, of Toronto, as telephone expert to prepare reports and evidence on the telephone problem for submission to the Dominion Railway Commission. It is also suggested that the city council should vote $500 to defray the expenses. In his report to the special committee the city attorney states that he has been unable to obtain information of the number of telephones controlled in the city by the Bell Telephone Company, as well as other knowledge that he deems necessary, including the cost of operation and the mileage of wire in use. He expects with the assistance of Mr. Dagger to secure all the necessary data.

Government Takes Over Saskatoon System

The telephone system in Saskatoon is being taken over by the Saskatchewan Government, Mr. J. A. Caldor, Minister in charge of that department having informed Manager Hair of the North Western Telephone Company, that unless the government offer for the purchase of the private plant were accepted the government would install a system of its own. The price of the private plant which the government will pay is said to be $73,000 and it is believed that the system will be immediately changed over to the automatic when the government assumes control.

On July 6 a new batch of 15 telephone companies were certified to, as to proper incorporation, by Mr. Edward J. Wright, Registrar of Joint Stock Companies for the Province of Saskatchewan.

Miscellaneous Items of Interest

The Manitoba Telephone Commission have considerable extension work in hand. A new exchange is being put in at Basswood and at Carman they have moved into their new offices in the Leader Block. The Winnipeg line has been extended to Winnipeg Beach where there is a large amount of summer business to take care of. A new line is also being built from Russell, northward to the town of Roblin. This will probably reach the Saskatchewan boundary and supply the town of Tago, Sask. The new St. John exchange is expected to be ready in October.

Trouble has arisen in Edmonton over the classification of employees in the Telephone Department. A number of men who are rated second class or third class claim they are first class men, the value of the higher classification being of course that a higher wage is paid, the first class men getting 41 2-3c. an hour and third class men 33 1-3 c. an hour. The superintendent of the department, Mr. W. R. Griffith, believes that he is best able to classify the men in his employ. Apparently it is a very difficult matter to decide to just which class a given man may belong.

Mr. Percy T. Roberts, manager of the Fort Frances Telephone Company, has asked the council to extend the franchise of the company so that a number of contemplated improvements may be carried through. Mr. Roberts said that they had now 165 telephone subscribers and the system was so congested that it was impossible to increase the service or its efficiency without expending some $1500. The request will probably be granted as the town is not at present in a position to take over the line.

Recently the chief medical health officer of Montreal issued a warning as to the dangers of infection from the mouthpieces of telephone instruments. The Bell Telephone Co. has written a letter to the council declaring that no such dangers exist, or if any do exist they are so insignificant as to be hardly worth noticing. In the letter extracts from the works of medical writers are given to show that the dangers of infection are not to be feared.

The New Brunswick Telephone Company have just opened a new exchange at Chipman, N. B. New lines have been run from Norton through Midland to Springfield Corner and from that up to the Narrows to Cole's Island and to Cody's and Cumberland Bay. All these are new points, the opening of which has resulted in an enlarged service which the company expects will reduce their rates in the territory affected.

The announcement has been made by the Superintendent of the Grand Trunk System at Toronto that the company will probably operate all their trains by telephones in the near future. This company has had two circuits in on trial for several months which have given such satisfaction that it is believed they will now extend the system over their whole line. It is estimated that this installation will cost a half million dollars.

The American Telephone and Telegraph Company is constructing a series of underground conduits which, when completed, will form an all-underground cable route of about 470 miles between Boston, Mass., and Washington, D.C. These cables are being installed with a view to eliminate the trouble and interruption from storms to which pole lines are so subject.

The Stewart Light & Power Company, organized about a year ago in Stewart, B. C., a town situated at the head of the Portland Canal, north of Prince Rupert, is establishing a telephone service. The switchboard being installed initially has a capacity of 50 phones, 34 of which will be in use from the start.

The City of Lethbridge has been complaining recently of a very poor telephone service especially in connection with long distance calls. Mr. N. B. Moors, district traffic manager of the Government Telephone System, with head quarters at Calgary, has been investigating the conditions and states that steps will be taken to put the service on a par with other cities in the west.

The Preston Car & Coach Company have under construction a new erecting shop which is 60 feet by 200 feet, metal clad. The roof is built in the style of bridge construction giving a clear space without a post to interfere in any way with the erecting of the cars.

Among the new telephone companies incorporated recently are the Port Stanley Telephone Company Limited, with headquarters in the village of Port Stanley, and the Russell Rural Telephone Company Limited, in the county of Russell, Ont.

The British post office will install two experimental automatic telephone exchanges, one at Epsom on the Strowger system, and the other at Caterham on the Lorimer system. Each will be equipped for 500 stations.

The increase in the number of phones in use in Montreal during the past 6 months is about 5500. In future a new directory will be issued three times a year.

The Innerkip Rural Telephone Company, Limited, Innerkip, Ont., has been incorporated with a capital stock of $25,000. Provisional directors, Dr. John Green Hossack, James Bicknell and Dr. Alexander Nichol Hotson, all of the Township of East Zorra.

Hydro-Electric Power System at St. Jerome, Que.

The town of St. Jerome, Que., is about to install a hydro-electric power system, and plans and specifications have been issued by Mr. DeGaspe Beaubien, of Montreal. The power plant which is intended to be developed is on the North River, about 23 miles from the town, where it will be transformed and distributed at 2,300 volts.

The plan includes a transmission line, high and low tension distribution systems, and street lighting. The latter system will be a combination of arc and incandescent lights. The transmission plant will include two generators, a motor generator and three 6600 volt. transformers. In the town power house there are to be two sets of water wheels, and three governors, the water wheels to be directly connected to the two generators. The house is to be of reinforced waterproof concrete. The main dam will be constructed of wood or concrete at the option of the town after receiving tenders. The specifications also call for the installation of a steel tube and saddle supports from the head gate to the power house and the supply and erection of a 125 h.p. induction motor.

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731. **Metal filament lamps, &c.**—A London firm wish to get into touch with Canadian importers of metal filament and metal filaments for lamp making; electrical accessories, and bell wire.

Large Deficit Turned to a Larger Profit

How Proper Accounting, Stoppage of Small Leaks and Judicious Expenditure on Equipment, Coupled with Efficient Management, Saved the Day for a Municipal Enterprise

By J. A. Jeckell.

Now that electricity has become a necessity of daily life it is advisable to briefly consider the supply of it from an economic and commercial point of view.

It is an axiom that a necessity ought to be supplied at the lowest possible price; first, because it will enable the consumer to purchase freely, and secondly, because by selling large quantities the cost of production is reduced, the seller thereby making larger profits. The following case, taken from actual practice, will prove this proposition. At Coventry, England, an electricity works was started in 1895 by the local authority, to keep out a company, with a capital of $125,000. By the end of 1901 this had been increased to $385,000. The loss per annum after paying interest on the capital and sinking fund, as the capital was to be replaced by this means, had increased from $8,500 in 1896 to $11,000 in 1901. At this time the writer assumed the management of these works with the object of trying to make them pay. This was how it was done. The condition of the business in 1901 was as follows: Capital expended, $385,000; revenue, $30,000; total costs of manufacture, including capital charges, $41,000; loss per annum, $11,000; cost per unit, 11c.; revenue per unit, 8c.; loss per unit, 3c. It will be seen that it was a fairly tough proposition to make this a paying concern. It was done by spelling the word "can't" as the Anglo-Saxon race has always spelled it, viz., without the "t."

Years previously, the writer, in a paper read before the Municipal Electrical Association, had calculated that the way to make undertakings pay was to sell large quantities at a low price. The time had now arrived for this theory to be put into actual practice.

General Proposition

The plant in the station was inefficient. It was h. t. single phase, 87 cycles. Only lighting had been obtained. As had happened in many places the industrial demand, which pays so well, had not been obtained, because it had not been catered for. Energy was charged at 6 cents per kilowatt hour for lighting, and at 4 cents per kilowatt hour for power.

Of course, the plant was running very inefficiently for 22 hours a day out of the 24. The first thing to do was to design new books so that the cost under each heading of expenditure could be worked out accurately each week or month. A special private ledger easily accomplished this. This ledger also showed a balance every three months, and as the accounts for the current period, week, month, quarter, half year, or year, as the case might be, appeared on the right-hand page of the ledger, and the accounts for the similar period for the previous year were written up on the left-hand page, a glance at once showed how matters were progressing.

This may seem to have caused a good deal of expense, but the first thing in a business is to prepare the books so as to show exactly where the money is going to, and from what source it is coming, then leaks can be stopped on the one hand and the source most promising can be further exploited. As a matter of fact this ledger only took a clerk one day a week to post, costing $1 per day. Some of the items of cost were found to be very high, notably coal, oil, wages.

As the works were only dealing with a lighting load, and current was kept on the mains all the 24 hours, the loss in steam, therefore in coal, and consequently in dollars, was very great, and a very high percentage of the total cost. It was quite obvious that if a motor load could be obtained and the plant run at a good load all day long, the loss in steam, due to standing by, would become a very much smaller percentage. Again, it costs in wages no more to run a large plant than a small one. Therefore as a motor load would cost little more for coal and no more up to a certain point for wages, no more for establishment charges, no more for capital charges, for land or buildings, and little for plant and mains, it was in every way desirable that a powerful move should be made to obtain this load.

Oil had been a heavy item, but filters for the engine oil were put in and an oil used which would stand repeated use. The oil when used had, previously, for the most part, been thrown away. Sight feed lubricators for the cylinder oil had been used, and, of course, the drivers had used a great deal too much, so mechanical feed lubricators, locked, so that only the amount necessary could be used, were installed. Engines will run with very much less cylinder oil than they generally are given.

The system was, as has been mentioned, 2,000 volts, alternating, single phase, 87 cycles. It was obviously impossible to run motors of any size off this circuit, therefore it was necessary to change the system. The mains were concentric single phase. Lighting and power had to be supplied from the same mains, as it was most desirable that in all extensions the capital outlay should be kept as low as possible, seeing that directly capital was expended, capital charges, in the shape of interest and sinking fund, accrued ,and had to be met out of the current year's revenue, and if not met by that means had to be put as a charge on the local taxes. It was therefore decided to change the system to two phase, 50 cycles, as by this means the single phase mains could be used. To accomplish this work it was necessary to increase the capital to $800,000. This included the new plant at the generating station, and the new mains, meters, etc.

A point that seemed to worry some engineers who saw what was going to be done, was how the various existing single phase sub-stations were going to be balenced on a two-phase system. The larger sub-stations were made two-phase, but the smaller ones in the purely lighting districts were kept single phase. Furthermore, every two-phase motor put on the circuit actually helped to balance the phases because if phase A was slightly over-loaded the pressure would be lower than that in phase B and therefore the motor would tend to take most of its supply on B phase and hence level up the phases. It may be mentioned that absolutely no trouble was experienced from this sourse.

Engineering Proposition

Owing to the fact that one-third of the $385,000 capital already expended was not represented by any living asset and another third by inefficient plant which would have to be scrapped at a very early date it was necessary that all the new capital should be spent on really productive plant which would earn dollars and that this new plant

should be as efficient as possible because though it may pay to install low priced plant with a low efficiency for a lighting load as this load is only on for some two hours a day, averaged over the year, yet when the plant is intended to supply energy for power and industrial purposes it is necessary that it should be as efficient as possible, even though it may cost more. This is because though it is running for many hours a day the capital charges remain the same, but the running costs will be a much more material consideration. It was also necessary to see that no money was spent on what may be called luxuries of engineering, which are very nice when they can be afforded, but are unwise to indulge in when an undertaking is showing a loss and every dollar spent has to be carefully safeguarded. The old plant was horizontal jet condensing engines. As this feed water contained 28 degrees of hardness, under this system the boilers, which were Lancashire make, soon scaled. On account of space it was decided that water tube boilers would be most suitable. As is well known, to make water tube boilers a thorough success the feed water ought to be quite pure and free from grease. Surface condensing engines were installed of the marine open type, similar to those used on board ship. Chemical oil separators were installed, as mechanical ones, however efficient at first, can never be depended upon to take out all the oil. These proved a great success, as the necessary precaution was taken of having them well over their work. Water softeners were also installed, and all rain water saved, the result being that high efficiency and capacity was obtained from the boilers. It frequently happens that an engineer will strain after an extra two per cent. in his generator, while losing 20 per cent. in his boiler house equipment. Pure water means a great deal less cost in cleaning and up-keep of the boilers, thus again saving dollars. A leaky steam joint also means dollars being sent to the skies, but no return has ever been obtained for unnecessary expenditure in this direction.

Selling Proposition

This naturally was the most important part of the business. Any engineer worthy of the name can put up a good job, granted he has unlimited money to spend. Many engineers can renovate old works and increase the productive power at a not excessive cost. But this is useless unless the output can be sold at a price which leaves a fair margin of profit.

Most of the private works in the district were driven by gas engines and the gas was supplied by the municipality, as well as the electricity, and seeing that the gas works were the old love and paying very well, the committee did not wish their profits to be encroached upon, and induced the council to veto the appointment of a salesman for the electricity department. It therefore fell to the writer to do the selling as well as the engineering, as of course, had not more energy been sold, due to the extra capital charges necessitated by the increased capital expended, the financial position of the electricity works would have been worse than it had previously been.

It was soon evident that no large increase in revenue could be expected from an increased lighting load, as with gas incandescent mantels maintained at a very nominal cost by the gas department, very few people would discard these and install electric light. The innate conservatism of people in England make them very shy of adopting a new departure. Fortunately there are other talking points with regard to electric driving over gas engine driving besides economy, and these had to be made the most of. In order to give possible customers confidence, electric motors were stocked and let out on hire, consumers having the opportunity of purchasing them if they wished, after trial.

Such talking points as the following were driven home with as much force and eloquence as possible. If a gas engine broke down it would probably do so when being over-loaded, as gas engines have a rooted objection to being called upon to give off more than their rated horse power. This would naturally occur when the works were being pressed for delivery and therefore just at the very time when a stoppage would be most disastrous. It would take days to repair a gas engine, whereas if a motor did give out, which was a rare thing, a phone message would enable another to be delivered and fixed while the men were off for dinner. Electric motors take up much less space than gas engines, and could, if necessary, be placed on walls or ceilings. If a consumer did not know exactly what power he required, and those who do know are very seldom met with, he could easily have, say, a 15 h.p. motor installed, and if this were too small or too large it would be exchanged free of cost, the foundation being arranged for almost any size. The services of the electricity staff were placed at the command of the customer free of charge.

In fact a very broad policy was adopted to satisfy the consumer as the main principle worked upon was "a satisfied consumer is the best canvasser a works can have."

The loaning of motors with a fair purchase clause was an immense success, as it induced confidence in the ability of electric driving to stand up to the work. The customer was not worried about looking after the motor as that was done by the electric department. He was not bothered about the horse power he required. He was not called upon to find the capital for the motors only as and when he desired to purchase. The result was that gas engines were scrapped right and left, and the ball having been fairly started, gained speed as it progressed. No one wished to be out of the running but to be up-to-date.

Energy for lighting was sold on the maximum demand method, the average price working out at 7 cents per kilowatt hour. Energy was sold for power purposes at 2 cents per kilowatt hour. After long negotiations several large orders, totalling 10,000 h.p., were obtained, at figures a great deal less than these and would have paid splendidly, but the powerful gas committee, who had no chance of doing the business, induced the council to reject them.- Municipalities in England too often will not allow the manager to run the works on thoroughly commercial lines. In spite of these difficulties the result was satisfactory, and at the end of 1910 the works were making, after paying interest and sinking fund, a profit per annum of $50,000, in place of a loss of $11,000 per annum in 1901.

The Electrical Contractor as a Merchant

Paper of Interest to Contractors and Central Stations Alike, read before the recent N. E. C. A. Convention at Niagara Falls

By Mr. E. E. Whitehorne.

The world is full of two kinds of merchants, the merchants we know and the merchants in disguise. The merchants we know are comparatively few, the dry goods merchant, the hardware merchant, the grocer, the butcher and the rest. But the merchants in disguise, they are everywhere and scarce one of them ever realizes that he is a merchant at all. Yet what essential difference is there between the man who sells hardware or shoes and the man who sells of his experience and his training, in short, his services, his advice and his time? The doctor, the lawyer, the architect, the engineer and the contractor are

all merchants no less because their stock is not all stored on shelves or handled with a truck and a bale hook.

If the word merchant means "man who sells things," can it fail to embrace the electrical contractor, even though his wares are varied in character? He sells supplies, he sells the work of his trained men, he sells his own skilled advice, he sells the readiness-to-serve of his entire establishment, yet he is no less a retail merchant, for his profit lies in the individual purchases of individual customers. He is a merchant to-day in all but mental attitude, and right there lies a great weakness.

Selling food and clothes to the people is the oldest business on earth. From the first bartering posts down to our modern department stores has been a long chain of evolution with competition ever stronger and a constantly broadening knowledge of human nature and how to sell. Consequently the present day merchant is a good man to watch, for after all it is the same people and the same human problems that confront the regular merchant and the merchant in disguise. One of the distinguishing characteristics of our electrical merchant, however, is his apparent disregard of those very methods and principles which have brought growth and success in the broader field.

Law of Supply and Demand

Nature has ordained that in the grand average the supply and demand shall balance, but in those sometime seasons when the demand becomes insistent because unsatisfied, it is woefully demoralizing to the agent of supply. We have an apt illustration in the history of the central station. When electric light was first offered to the public on a practical basis, it was such a marked improvement over the open gas flame that the people clamored for it. No effort was required to sell it and soon the men in the lighting companies began to feel that they were conferring a favor on the consumer by accepting his contract. This bred the "public be hanged" attitude that nourished the seed of "municipal ownership" and raised such a furor throughout the country a few years ago. But it happened that the cry of municipal ownership came loudest just at the time when this "come easy" business was about used up. So there was a rude awakening when it became necessary to actually dispose of the product of the generators in a market which was antagonistic.

The old central station mental attitude had to give way to men who could see the proper relation between manufacture and sale, for that was the crux of the matter. Because in the early days it was the inventor, the developer and the engineer who had won the fame, the industry forgot that it was only in its commercial aspect that the production of electricity could benefit the world and become a real business success.

The same conditions have governed the electrical contractor in his development. He started as a "screw driver electrician" and a "handy-man," stringing bell wire, fixing locks and doing general tinkering. Then came the work in the lighting field and he began to accumulate a stock and soon grew into a real live contractor, but all the time the demand was pushing him on. He was not really selling, he was answering the call of people anxious for services and simply following up the inquiries reported by the lighting company, taking care of regular customers and, of course, from time to time lightly scooping off those large gobs of cream which appeared floating on the surface in uncomfortable positions. Consequently, because his business has increased automatically with the growth and popularity of electric service, the electrical contractor has had small occasion to consider whether he is a merchant or not, and as a result there is hardly a city in the land where there is any well defined headquarters for electrical merchandise.

The ill-informed citizen whom we must recognize as representing the majority among our prospects, simply knows that electrical matters are in the keeping of the electric light company and the electrical contractor. The electric light company as he sees it sells electric light and in a corner of its office exhibits a lot of current consuming apparatus such as irons, fans and vacuum cleaners. The electrical contractor's business is apparently to wire houses though behind his counter he sells lamps and lamp cord and sockets and the same general line of appliances. Mr. Householder is probably suspicious of the central station because he knows they want to sell more current. He is suspicious of the contractor for the same reason that he doesn't trust the plumber, he is afraid that a call on him will mean a man and a helper on the job for three hours. His conception of the plumber is two men smoking on the cellar steps while the boy goes back to the shop for a piece of candle and a left-handed monkey wrench. His idea of the electrician is based on his experience with the plumber.

Need of an Electric Store

What he wants is an Electric Store, just like a hardware store. When he wants to put a lock on a cupboard door, he goes to the hardware man and tells his troubles and the hardware man shows him some new scheme for a hasp and padlock that just fits the case. He wants to be able to go to the Electric Store and say "I want to use a fan in my bedroom while the light burns. How can I do it?" He wants to have the current tap and the flush receptacle laid before him and explained, not by a grimy stock clerk,but by the same kind of salesman he finds in other stores.

You know how it is now in most places. Mrs. Smith drops into the company's office to buy a fan. There are a couple running in the show windows surrounded by fuses, cutouts, switches and a lot more bric-a-brac which means nothing to the average citizen, but otherwise there are no signs of life. As she enters, however, a boy in a greasy pair of overalls comes out of a back room with his hat on and walks behind the counter. She picks her way in between a tool bag, coils of wire, a step ladder and bundle of moulding.

"I want to buy an electric fan" says Mrs. Smith.

"A.C. or D.C.?" asks the boy, which of course means about as much to the good lady as a line of Hottentot.

"I'm sure I don't know," she says, "but we live on South Terrace Street."

"Then you don't know what your voltage is either, I suppose " This from the individual in overalls as he begins to pour over a map, and Mrs. Smith never having realized that she owned any voltage is properly impressed with her deplorable ignorance in matters electrical.

Finally the boy announces that it's "A.C.—hundred and eighteen," and lifts down a 12 inch fan which is satisfactory.

"How much is it?" asks the customer and after a fruitless search for a price tag the boy calls back, "Hey, Jimmie, how much is the 12 inch A. C.'s?" And Jimmie being in the inner office and not knowing what discount to figure, yells "Who's it for?"

"A lady," shouts the boy.

"Oh," says Jimmie, "Fourteen dollars is the price" and Mrs. Smith goes off with her fan and the haunting suspicion that she is "stung again "

Perhaps I've overdone this a bit, but you know that just this sort of thing is happening every day. The contractor has made the mistake of looking on himself as a contractor rather than a merchant. He has never denied the fact that he ought to advertise, to keep a more attractive store, and to give more attention to present customers, but after all it has seemed a secondary matter and has

suffered the penalty because his office organization is small and absolutely dominated by the details of handling the jobs, keeping the men's time, buying stock and collecting bills.

So he sits back and says, "Yes, I'm the electrical contractor in this town and before many years, when the people wake up to what electricity will do for them, I'll have a big thing here." But in the meantime who is going to have the Electric Store which will some day and soon be far more important to the average household than the hardware store? Is the contractor content to wait for the natural growth of the population and the gradually increasing popularity of electric service to bring him prosperity? Or is he going to take the cue from the progressive merchants in other fields and create an even greater market for his electrical merchandise? And remember, electrical merchandise means not only appliances and fittings sold over the counter, but that other merchandise in disguise, the services of your men who will of necessity install a great part of it. The word contractor does not embrace the scope of the business even of to-day. You are engaged in the sale of electrical merchandise, but the service you offer your patrons covers its installation and your expert advice. You are, or should be, headquarters for everything electrical, except the current.

Attitude of Regular Merchant

Let us stop for a minute and assume the mental attitude of the regular merchant. Let us look at it through the eyes of the merchant who knows he is a merchant. Consider a good, bright, brainy, ambitious young man, who, we'll say, has worked three years with a central station as salesman, and then put in five years in a hardware store, not one of the old time combination curiosity and junk shops, but a real live, enterprising and prosperous concern. He would have the foundation for a pretty practical conception of what the Electric Store could expect to accomplish by modern merchandising methods, say in a growing city of 20,000 or better.

He would argue to himself that the Electric Store must certainly be as much needed by the average family as the hardware store. When a man's house is built it is completely equipped with hardware. It has to be. Yet though you would think he would have no further use for a hardware store, he is constantly wanting some hinge, or bolt or screws, a garden tool or a pocket knife. The householder can't get along without the hardware store. Isn't it obvious that by the very nature of things electrical he needs an Electric Store far more than the hardware store?

When he builds a house only the lighting equipment is installed, as a rule, because by the time he comes to that he has a hungry pocket-book, and he promises himself that the other comforts of electric service will be added from time to time, later on. Consequently in the average family where the scope of electric service is appreciated, there is a continual planning for more of the electric home comforts. First they buy a fan, then a toaster, then a vacuum cleaner and then a general utility motor, and lamps, current taps, separable plugs, receptacles, sockets and switches are required, year after year, just as we need new door knobs and hinges. But the difference in this, that while hardware receives comparatively little wear, we live with our electrical equipment, we use it constantly, changing it about every now and then, and it is ever a live personal matter with us. That means that the natural wear and tear will tend to make permanent customers for the Electrical Store.

We are speaking of those families who recognize the [illegible] What of the others. Our trained merchant would count on this majority as the vast untouched market which can be reached, interested, educated and secured as active consumers of current and customers of the Electric Store, simply by the ordinary methods employed in the upbuilding of any other retail shop. But here's how he would go about it.

The most important thing is location. If you send out the "Sandwich man" with a sign on his front and back, you tell him to walk on a busy street, not on the canal tow path. If you want the people to see your show-windows and come in and buy, remember there are more of the public than there are of you, and take your front door where the crowd not only can find it, but can't miss it. In other words there is only one place for the Electric Store and that is in the middle of the shopping district, on the right street and on the right side of the street. To start a store of this kind out of a shopping district would be about as foolish as to put a big ad in the morning paper and tell them to run it only in the first hundred copies. What you want in the newspaper is circulation, and a show-window that is seen by 8,000 people is just four times as valuable as the window that 2,000 people pass by. There's only one way to reckon the value of the location and that is to count the traffic.

So our ex-central-station-and-hardware man would secure a small store in the heart of the city, paint it a bright attractive color inside and out and put up a good sized, forceful electric sign. He would decorate his windows, not with plug fuses and rosettes, but with household devices and the things that will interest the average man and woman. He would display his goods inside as the department store man does, keeping his rough and dirty moulding, conduits and second-hand junk motors out of sight. In short, his Electric Store would be clean, comfortable and inviting like any other successful store that sells to the public, and the man or men behind the counters would be real salesmen, not stock boys, wiremen's helpers nor bookkeepers who stroll in when the door bell rings and "wait on" the customer, though the customer is apt to do most of the waiting. He would make his store a feature of the city's shopping district, advertising it in the newspapers continuously and consistently, though not necessarily in large or expensive space. He would have special sales of this, that and the other thing to draw the crowds, and back them by clever and regularly changed window attractions and the other devices of the department store man.

People Will Pay for Service

This generation expects and demands service and is willing to pay for it. The electrical contractor has been overlooking this point. It is an age of specialists and when we want information and assistance we go to headquarters, and headquarters is supposed to be ready with the last word and a bill. People are willing to pay the price if they get the service and it is no less true in its application to the electrical contractor than to any other man.

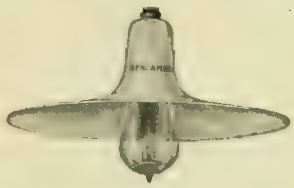
The whole thing comes right down to this. The contractor has not appreciated the fact that he is actually a merchant or there wouldn't be such a marked contrast between the atmosphere of the average contractor's office and the successful shoe or hat store.

In short, it's high time for the contractor to take hold of his business with both hands and a whole brain, and make his sign mark the headquarters for electrical merchandise. There's an important question to be answered in this country before long and that is—Who is going to own the Electric Store?

Electrical Equipment for C. N. E.

The Canadian National Exhibition has always been noted for fine electrical displays and for the general generous illumination of the grounds. This year will be no exception to the rule, as the hydro-electric department of the city of Toronto have the installation of something over 20,000 lights in charge.

The buildings of the Canadian National Exhibition have all been re-wired and installed with new lighting units during the past month. For this purpose 1462 Benjamin reflector sockets have been used. These units have been run in series of six so that low voltage tungsten lamps may be used giving the benefit of the strong and durable filament, so well known in lamps of this type. The reflector sockets used have been mostly of the 20-in size and are made with a separable fitting above the reflector so that the fixtures may be taken down after the exhibition is



Reflectors Being Installed for C. N. E.

over and stored away until next summer. The sockets consist of a deeply-hooded one-piece enamelled steel reflector and a specially designed socket. These reflectors are made in both flat cone and bowl type and for lamps from 25 watts to 500 watt sizes. Provision is made for carbon and short base lamps, skirted base lamps, and large base lamps. Each is designed for use with a definite range of lamps, and with particular regard for the correct relation of lamp filament and reflecting surface.

Canadian Boving Expansion

Owing to the continued expansion of the business of the Canadian Boving Company which necessitates the frequent absence of their manager, Mr. F. A. Yerbury, from the head office in Toronto for considerable periods, the English parent company have entered into arrangements with Mr. Aubrey V. Clayton, M.I.E.E., to temporarily conduct the company's business in Canada. During his stay here. Mr. Clayton will also look into the possibilities for establishing works in this country for the manufacture of some of the Canadian Boving Company's various specialties including turbines, pumps and pulp-making machinery.

Mr. Clayton's qualifications in this respect are unrivalled owing to the unique experience he has had of English, American and European methods. His ten years pioneering experience in Scandinavia, where he was partly responsible for the starting of the Magnet Company, and entirely responsible for the inauguration of the Clayton-Unger Works, an amalgamation of which interests now operates with a capital of about one million dollars, should be of great assistance to him here. The chief manufactured products of Scandinavia, timber and pulp, are similar to our own products, and it has been in connection with machinery for the manufacture of these products and the equipment of hydraulic power with electrical transmission that Mr. Clayton has been chiefly occupied.

The D. P. Battery Company announce that they have just secured the contract for a 500-volt central station battery for Barnstaple, also for a battery for the Newark Corporation Water Works.

Personal Mention

Mr. Hillard Foster has been appointed manager of the Guelph Radial Railway and the Guelph Water Works Systems.

Mr. J. J. Hackney, formerly manager of the Guelph Radial Railway, has been appointed manager of Public Utilities, at Port Arthur.

Mr. Cecil B. Smith, recently, as their guest, addressed the Canadian Club of Prince Albert. Mr. Smith dealt with the question of the value of ample electric power supply in the growth of a city.

Mr. Albert J. Johnston, formerly manager of the new business department of the Montreal Light, Heat, and Power Company, has been appointed sales manager of the Robert Mitchell Company.

Mr. John J. Deck has been elected vice-president of Dossert & Company, New York, to fill the vacancy caused by the resignation of Mr. Charles A. Flynn. Mr. D. J. Fitch has been elected secretary and treasurer of the same company.

Mr. Kelly, of the Canadian Tungsten Lamp Company, was entertained at luncheon by a number of his friends in the trade, on the eve of his departure from Montreal, where he has been temporarily in charge during the illness of Mr. Grose.

Mr. N. B. Gibbons has been appointed manager of the electrical department of the Canadian Fairbanks Company, Montreal, in succession to Mr. Lachapelle, who is now the eastern manager, with offices in Montreal, of the R. E. T. Pringle Company.

Mr. E. H. Caughell has been appointed to the position of accountant and assistant manager of the light, heat and power department of St. Thomas. Mr. Caughell was connected with the management of the St. Thomas street railway before it was taken over by the city.

Mr. F. W. Hollingsworth, a recent addition to the Canadian Tungsten Lamp Company's selling staff, but who is already well known throughout the West, is in Vancouver looking after the Western ground. Mr. Hollingsworth states that prospects are of the brightest and that business is exceptionally good.

Mr. A. E. Reoch has been appointed secretary-treasurer of the Marconi Wireless Telegraph Company of Canada, Limited, Montreal, succeeding Mr. H. G. Matthews. Mr. Reoch has been connected with the Marconi companies for nine years—three of them in London and the remainder in Canada. He was formerly superintendent of stations.

Mr. E. A. Graham has been appointed assistant to Mr. Ross, electrical engineer of the Winnipeg Electric Railway System. Mr. Graham leaves the employ of the Westinghouse Company, with whom he has been connected in the installation of their electrical apparatus for the Winnipeg municipal power system, and previous to that in a similar capacity in London, Ont.

Mr. J. G. Monahan has been appointed Western Manager for Ferranti, Limited, with offices and warehouse at 56 Albert street, Winnipeg. Mr. Monahan is thoroughly familiar with Ferranti products, having travelled for some time for Mr. George C. Royce, Canadian representative. After a two months' trip through Western Canada he is convinced that these provinces are destined to provide a very large market for electrical apparatus. Winnipeg, he saye, is a splendid centre for the electrical business, with development only in its infancy.

Questions and Answers

GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.

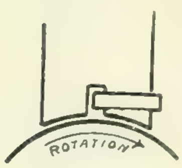
Commutators on A. C. Motors

Q.—Why are some small motors, such as those for vacuum cleaners, small fans, etc., made with commutators even when intended for alternating currents only, instead of being of the induction form?

A.—A brief answer to the above is that by applying a commutator to a single-phase motor, greater starting torque can be procured than by any of the other devices for starting single phase motors. Moreover, the motor is, in general, more fool-proof, as commercial single-phase motors as now supplied with commutators, can be started by merely closing a switch, that is, there is no double-throw starting switch which has to be thrown over and back again, nor any compensator which has to be thrown to a starting position and then over to a running position. That is why these motors are considered preferable for vacuum cleaners and other apparatus which is usually handled by absolutely inexperienced persons. A factor to be considered also is the very much lower cost of manufacture of the commutor type.

Going into the question a little more fully the following explanations may be of use. The modern commercial circuits supplying current to residences and smaller buildings, are, in nearly all cases now-a-days, single-phase, and that is why the manufacturers are developing single-phase motors. Now a single-phase motor has absolutely no starting torque, and in order to overcome this lack, three well-known devices are employed: One is what is known as a shading coil. The second is known as a split-phase scheme. The third is applying a commutator.

The shading coil is a conductor of low resistance, surrounding a portion of a field pole of a single-phase motor, as per sketch shown. This shading coil causes a rotating field such as would be caused by an unsymmetrical polyphase circuit, thus causing the rotor to start and accelerate to full speed, provided the required starting torque is low. This method is not practicable in any thing but shall motors, such, for example, as fan motors..



In the split phase scheme, usually a three phase winding is used on the stator—two of the three leads being connected directly to the supply circuit. The third lead is connected to the supply circuit through a combined resistance and reactance placed in series across the supply circuit, being joined to the connecting point where the resistance joins the reactance. This resistance-reactance circuit is connected in by means of a double throw switch, and left in position long enough to bring the motor up to speed, when the switch is thrown over, thus disconnecting the third lead with its resistance and reactance. This scheme has the same effect as supplying the motor with current from an unsymmetrical polyphase circuit, thus producing a rotating field of sufficient strength to start motors of moderate size. The starting current, however, is abnormally high, and therefore, with such motors, clutch pulleys are provided to reduce the starting torque required of the rotor and starting rheostats are used to reduce the starting current to a reasonable amount. These pulleys are usually designed to act automatically and to rigidly join the pulley to the rotating shaft when the motor reaches about three-quarters of full load speed.

The third device above mentioned is to put a commutator on the rotor and to place two brushes in contact with commutator, 180° apart and short-circuited on themselves. A line drawn across the commutator and through the centres of the two brushes is inclined at a slight angle to the field of stator, and in this way a comparatively large starting torque is obtained with a moderate starting current. This style of motor has excellent efficiency and power factor characteristics, and is very robust, as it can be started without any starting resistance, by merely closing the supply switch.

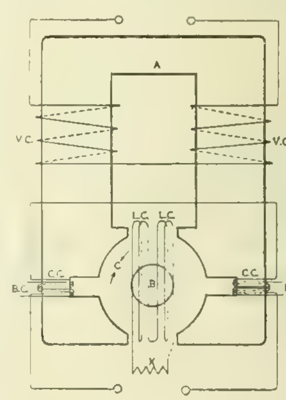
Of the three schemes the commutator scheme, notwithstanding the fact that a commutator is usually objectionable, for reasons that are well known, is preferable for small motors, say up to 5 h.p. as it gives a first-rate commercial article which is as nearly fool-proof as can be obtained with this class of apparatus.

Principle of a Watt Meter

Q.—Do you not think the ordinary operator would be enabled to do his work more intelligently if he understood the internal construction and theory of his instruments? A watt meter is something of a puzzle to me and I would be obliged if you would give a brief description of a typical instrument.

A.—There can be no doubt that an intimate acquaintance with the tools he uses is of inestimable value to every workman. A brief description of a well known type of watt meter is given herewith.

These wattmeters are intended for measuring accurately the power in alternating-current circuits at any power factor. The polyphase meters indicate the true power factor. The polyphase meters indicate the true power in a two-phase or three-phase circuit regardless of the unbalance that may exist. The single phase meter has a magnetic circuit similar to that shown in the accompanying Fig. The coils V. C. are connected through a resistance across the voltage of the circuit, and the coils C. C. carry the current of the circuit. Owing to the inductance of the coils V. C. the current in them is almost in phase quadrature with the voltage of the circuit. In order that the torque shall be proportional to the true watts at all power factors it is necessary that the current in the voltage coils be in exact quadrature with the voltage of the circuit. To secure this relation the lag coil L. C. is used; this is a short-circuited coil of properly adjusted resistance, which provides a slight additional lag in the same manner as a short-circuited coil placed around a transformer core. The coils B. C. are balance coils used to equalize any difference in the windings of the voltage coils. As the meter is not inherently independent of temperature variation, the moving element is made of a special metal with zero temperature coefficient.



The polyphase meter consists of two independent single phase elements with drums attached to the same shaft. The total torque on the shaft is therefore the algebraic sum of the torques of the two elements, whether they are connected in a single-phase or in different phases of a polyphase circuit.

Industrial Progress and Trade Notes

First Railway Operation at 1500 Volts d.c.

The Westinghouse Electric & Manufacturing Company were awarded the contracts for the electrification of two sections of road of the Piedmont Traction Company in North Carolina and South Carolina. This contract is of special interest on account of the fact that this is the first railroad electrification in America to be equipped with apparatus for 1500 volts direct-current, the average modern direct-current railway using current of from 550 to 650 volts. Considerations of economy in transmission have led to the increase of direct-current voltage in railway work and a number of lines are now operated on 1200 volt equipment. One section of the Piedmont system to be electrified is 35 miles in length, extending from King's Mountain, N. C., to Charlotte, N. C. The other section is 95 miles in length and extends from Greenwood, S. C., to Spartanburg, S. C., with a 10-mile spur from Belton to Anderson.

The power for both of the electrified lines will be purchased from the Southern Power Company and fed to the line through motor-generator sets in sub-stations. The equipment of the North Carolina section includes substations at Charlotte, Castonia, and King's Mountain, each of which is equipped with one 500 kw. motor generator set with switchboards and other suitable apparatus. The South Carolina section has sub-stations at Dead Falls, Belton, Anderson, Greenville, Greers, and Spartanburg, requiring seven 500 kw. motor-generator sets and two of 300 kw. capacity, together with transformers, switchboards, and other apparatus. Four classes of service will be maintained on both of the above roads, namely, limited express passenger service, local passenger service, light freight and express service, and heavy freight service.

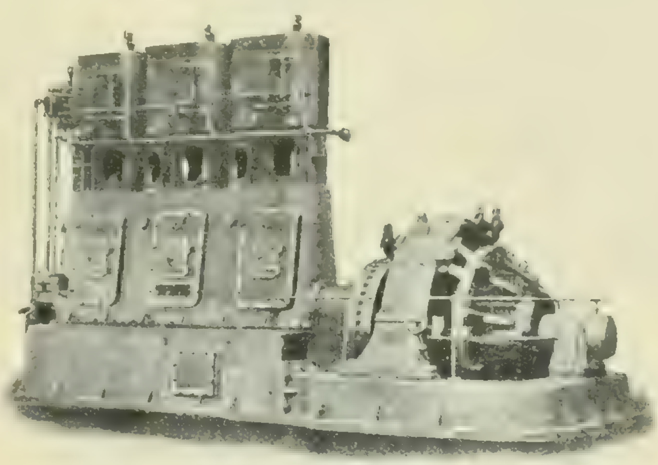
The present orders include the following apparatus:—ten 500-kw. motor-generator sets; two 300-kw. motor generator sets; nine switchboards; three 500-kv.a oil insulated, self cooling transformers; twenty-three quadruple equipments of No. 321 interpole railway motors, for passenger service; eight quadruple equipments of No. 321 interpole railway motors to be mounted on standard box cars for handling express and package freight; six 55-ton locomotives with quadruple equipments of No. 308-B-5 interpole railway motors for heavy freight service,—these locomotives will each be capable of handling an 800-ton train. The control for the passenger cars, express cars, and locomotives will be the Westinghouse type HL unit switch control. It is understood that the work will be put in hand at once and pushed to rapid completion.

Electrical Equipment of the Olympic and Titanic

A current issue of The Electrician describes the electrical equipment of England's largest ships, the Olympic and Titanic, the two largest boats afloat. Electricity is used in all departments of these mammoth ships and apart from lighting the following power uses to which electricity is put on these vessels will be of interest on account of their great variety. The principal are:—Electric deck cranes, from 30 to 50 cwt.; cargo, boat and engine room winches; passenger elevators; stores, mail and pantry lifts; ventilating and stokehold fans; cabin fans; motors for cylinder lifting gear, turbine turning and lifting gear, and condenser sluice valves; pneumatic conveyor for Marconigrams; gymnastic apparatus; domestic machinery (such as ice rocker, dough mixers, potato peelers, roasters, knife cleaners, soup and sorbet machines mincers); electric heaters and fires, hot plates, electric baths and irons; main steam whistles; sounding machines; stoking indicators; boiler room telegraphs; clocks; watertight doors; helm indicator; illuminated pictures and signs; chimes; bells; loud-speaking telephones and service telephones; submarine signalling; wireless telegraphy.

The main generating plant, which is probably the largest ever installed for marine work, consists of four 400 kw. dynamos. The engines develop 580 B. h.p. each, and are of the vertical three crank compound forced-lubrication type 325 r.p.m., with one high pressure cylinder 17 inches diameter and two low pressure 20 inches diameter. They receive steam at 185 lbs. pressure and exhaust either into a surface heater or to a condenser. The engines are direct coupled to the generators.

An auxiliary system is also installed consisting of two 30 kw. sets situated in a recess of the turbine room at the saloon deck level, well above the water line. In the case of accidents to the main generators these auxiliary



One of Four Units installed on Steamship Olympic

units will supply sufficient light to move about the vessel and carry on any operations that may be necessary.

A large proportion of the power is taken up by electric fans which number 76 made up of 12 for the stokeholds from 40 to 55 inches diameter, and 64 for ventilation of the vessel. The aggregate current taken for ventilating purposes amounts to 5250 amperes. The number of incandescent lamps installed amount to about 10,000 ranging in size from 16 c.p. to 100 c.p. These lamps are for the most part of the latest tantalum ship type. In the first class state rooms there are fitted sockets for electrical portable lamps or fans and special dimming lamps with two filaments, so that a light of small candle power may be kept burning through the night. There are also a number of electrical illuminated signs distributed through the first and second class accommodation, directing passengers to the entrances, public rooms, etc.

A Suspended Railway System

A suspended railway based on practically the same principle as the cableways which have long been used for the transport of coal, ore, etc., is being installed between Chamonix at the foot of the Mont Blanc range and the

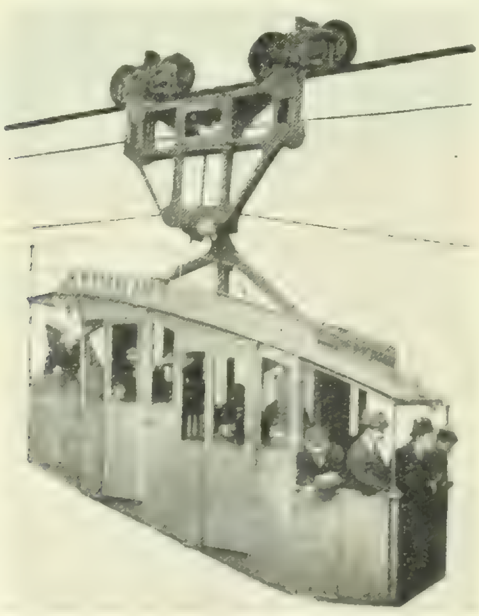
Aiguille du Midi, Switzerland. A short description appears in a current issue of the Electrical Review, and among the advantages claimed for this type of railway are that it is independent of the configuration of the ground allowing for installation in otherwise impracticable country and also that the cost is very much cheaper than the ordinary railway.

A view of a loaded car in operation on this line is shown herewith. It will be seen that this suspended railway is constructed with three cables,—(1) a supporting cable serving as runway for the truck carrying car, (2) an endless driving cable which is 12 mm. in diameter, and (3) a brakeing cable of the same size. The last named two cables pass at the lower station over two vertical guiding pulleys and thence over return pulleys. At the upper station where the driving gear is installed the wires are carried over the driving and return pulleys. All the cables and accessories are said to have been calculated for a tenfold factor of safety.

The first section of the road is 1870 meters horizontal distance, climbing a height of 750 meters; the second section climbs to the same height over a horizontal distance of 1190 meters. The mean gradients, therefore, are forty and sixty-three per cent. respectively. The track of the cableway follows as closely as possible the configuration of the country, the driving and supporting cables being carried by substantial iron trestles placed from 40 to 90 meters apart.

The cars readily accommodate twenty to twenty-four passengers. Their weight when fully loaded is four tons. Two cars will operate in each section for simultaneous up-hill and down-hill travel.

Electric motors are used for driving the cableway direct connected to a horizontal shaft with speed reducing gear from which power is transmitted by a second pair of gear wheels to a second intermediary shaft and by bevel wheels to the main shaft carrying the driving pulleys. All



signals relating to the service are given by electric bells. A comprehensive telephone system connects the stations among themselves and with the different cars.

H. W. Johns-Manville New Building

The accompanying illustration shows the new 12 storey office building now being erected on the South-west corner of 41st street and Madison avenue, New York City, for the H. W. Johns-Manville Co., who will occupy it in its entirety about May 1st, 1912, as the general office and new sales rooms of the company. The building will be of fireproof steel construction throughout and will contain two Otis passenger elevators of the latest type. Each floor will have an area of 2,500 sq. ft. and a total area for the 12 floors and basement of 34,500 sq. ft. This com-

pany states that they now have about 5,000 employees including 406 salesmen travelling through various sections of the United States and Canada.

The National Electric Heating Company

About two years ago a small company calling itself the National Electric Heating Company, Limited, was formed for the purpose of manufacturing electrically heated devices. Business was carried on for a few months in a very small way, the factory being located in Galt, Ont. These two short years, however, have sufficed to change this small concern into the largest exclusive manufacturer of electrically heated devices in Canada. The cause of this unusual success is generally credited to the energetic managing director, Mr. Asher Pritzker. Mr. Pritzker himself disclaims any credit for the success of his company and says it is his "element" that has been at the bottom of the rapid development. Tangible proof of real success is clearly shown, however, in the new combined manufacturing and office building just opened by this company at 544-48 Queen street east, at an expense of some $60,000 for building and equipment. The building is shown herewith and consists of a three-storey 40 x 100 foot brick structure located on a generous sized lot.

The company manufactures everything in the way of household electric conveniences, irons of all kinds and sizes, toasters, disc stoves, chafing dishes, percolators, etc., etc. When the building and equipment is all completed electric ranges and other modern necessities will be added to their manufactured list. Mr. Pritzker makes a strong point of the fact that they manufacture all the parts of all

their articles right on the ground and so can watch and guarantee the excellence of the material and of the workmanship.

It is of interest to note the cost of operating some of the modern household appliances as shown in Mr. Pritzker's demonstration rooms. For example, a four-pound iron consumes 300 watts per hour, a 6-lb. iron 400 watts, an 18-lb. tailor's iron 700 watts. A percolator, quart size,

consumes 300 watts per hour; a chafing dish, 400 watts. This particular chafing dish is a combination dish and disc stove and is a very useful piece of utility apparatus. The toaster manufactured by this company is the kind that toasts on both sides at once, and consumes 600 watts per hour. The length of time required to toast one piece of bread is approximately one minute, requiring 10 watts, and therefore costing one-tenth of a cent with power at ten cents per kilowatt hour.

The company has made arrangements to pack each device, in future, in a corrugated air-tight box. This will insure the arrival of the apparatus in the hands of the customer in perfect condition.

The president of the National Electric Heating Company is Mr. Bernard Enusevsky; managing director and secretary-treasurer, Mr. Asher Pritzker; western representative, Mr. Philip Pritzker.

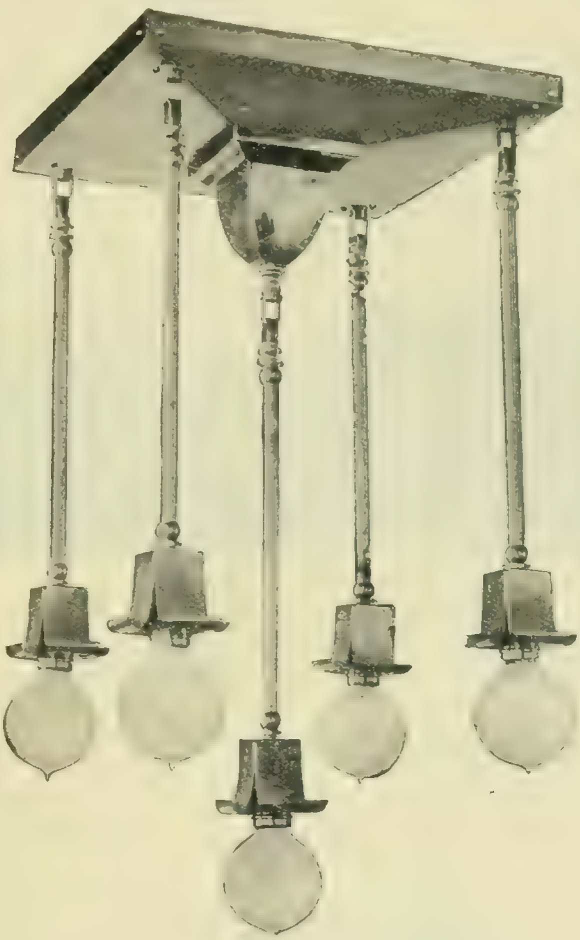
Hydro-Electric Supply Co.

A new company known as the Hydro-Electric Supply Company has commenced operations at 166 Bay street, Toronto. This company will represent the Engineering Equipment & Supply Company of Montreal, and their well known lines of Locke Insulators, Hartman Circuit Breakers, Excello Specialties, etc.

They also carry in the Toronto warehouse full lines of Carbon and Tungsten Lamps, Cottonduct, Fibreduct, and Rubberduct flexible conduit; Excello Push Button Switches, Tumbler Switches, Flame Arc Lamps, and Flame and Pure Carbons. The manager of the company is Mr. C. C. Bothwell.

Shower Effects in Fixtures

Showers are popular fixtures. To get this effect it is necessary to have a large ceiling plate from which can be dropped a number of lights. To make a plate in one piece, such as is commonly used, entails considerable expense, as the size of metal necessary is very large, and handling amounts to a considerable item, making the cost of the finished fixture rather high. To eliminate this extra cost and still give the same effect with as neat an appearance, the F. W. Wakefield Brass Company, of Vermilion, Ohio, have made this plate from a number of similar pieces of smaller sized metal so joined together that the places of joining form ribs on the inside of the fixture, giving it additional strength and rigidity and reducing the cost to a nominal amount. The fixture is supported by a special method which permits of a regular crow foot or insulating joint attachment. It also provides for placing the fixture in position against the ceiling without turning, a feature worthy of consideration when you realize this eliminates the possibilities of marring the finished ceiling. The above method also reduces time in handling and installing to a minimum, and the interchangeable feature, allowing a large



variety of different designs by using different standard Wakefield material, is claimed to make this a very popular line and one very profitable to handle.

Prepayment Meters

Messrs. Chamberlain & Hookham Limited, of Birmingham, Eng., who, as we announced in our July issue, are opening up a branch in Montreal for the sale of their meters, are putting on the market among other things a prepayment meter which has been very largely adopted in England during the past year. Its simplicity and small size are the two most striking features, the releasing mechanism being an ingenious adaptation of the principle of a clock escapement. Owing to this simplicity the cost is very little above that of ordinary meters while the high

torque of the meter portion ensures great accuracy on the low loads common to this class of business. We hope to illustrate this meter in a later issue.

Tungsten Lamps Delivered by Aeroplane

The average central station manager would hesitate to place his rush order for tungsten lamps to be delivered by "aviation express" but this is exactly what happened recently in a Sussex, England, town—at any rate this was the manner of delivery chosen by the manufacturer. Whether it was a question of the cheapest way, the quickest way or the safest way our informant does not state, but the records show that a speed of 80 miles an hour was attained and that the lamps were delivered in perfect condition.

The shipment consisting of a consignment of Osram lamps for delivery to Messrs. Page & Miles, Western Road, Hove, was made by the General Electric Company, Limited, of London and carried by Mr. Barber, of Hendon, in his Valkyrie monoplane, which is operated by a powerful Gnome engine. The flight was made successfully, the consignment of lamps placed on a truck of Messrs. Page & Miles and the return journey completed without mishap.

Shipment of Osram Lamps by Aeroplane

Not the least important factor in this wonderful feat was the telegram received by the General Electric Company from the consignees stating that the osrams when opened were found to be in "perfect condition."

Factory Products, Limited, Toronto, are sole Canadian agents for "Osram" lamps in Canada.

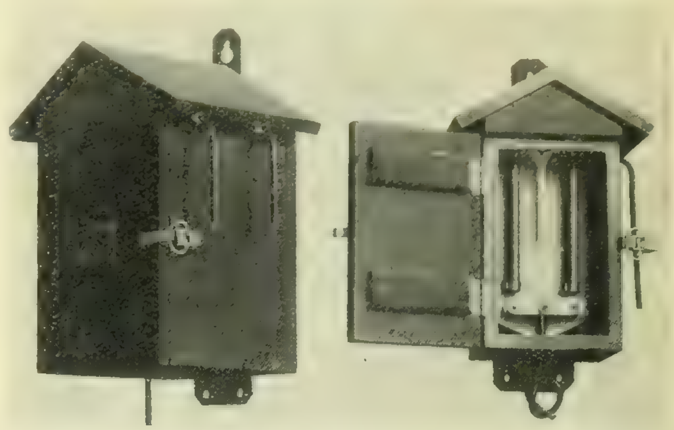
Type G Lightning Arrester

The Westinghouse Electric and Manufacturing Company has placed on the market a new design in the Type G lightning arrester for the protection of apparatus on alternating-current circuits having voltages not exceeding 2500, and capacities not exceeding 1000 kw.

The type G arrester consists of a series of air gaps between non-arcing metal cylinders arranged in a row and connected in series with a graphic resistor. The cylinders and resistor forming the unit, are mounted on a porcelain base which, in turn, is mounted within a wooden box as shown in the accompanying illustration. In a two-pole arrester, the unit is mounted on the back of the box while in the three and four-pole arresters two units are used, one mounted on each side of the box. On the three-pole style, one of the resistor rods and its clips are omitted from the unit.

The box is made of well seasoned wood and is entirely weatherproof, enabling the arrester to be mounted out doors in any exposed location desired. On a two-wire circuit, the arrester has one wire connected to the top of each graphite resistor and the ground wire is connected to the middle gap of the series. On four-wire circuits the same scheme of connections is used but two units are necessary and the connections of both are the same. With three-wire circuits, two units are used, and the connections are the same as for four-pole circuits except that there are but three line connections instead of four.

The operation of the type G arrester is as follows: If an excessive potential is developed on the line, the electric discharge arcs from between the metal cylinders and



the excess charge of electricity flows to ground, relieving the line of the excessive stress. The resistance offered to the flow of current by the carbon resistor prevents an excessive current passing through the arrester to ground, and the tendency for a destructive power arc to follow the discharge arc is thus counteracted. The type G arrester may be applied on circuits of which the sources of supply are capable of developing any amount of energy.

A New Automobile Trouble Finder

The McGill Manufacturing Company of Valparaiso, Ind., are putting on the market a new trouble finder which is to be known as the "Thumswitch." This is the first one to be offered to the user. It enables the finding of troubles quickly and does away with the danger of explosion and injury caused by broken or hot lamps in contact with oils. It is made with a solid brass guard, and is furnished complete with cord and terminal which may be attached to any battery. Any miniature lamp, carbon or mazda may be used, from 2 to 6 volts in size.

The Rudel-Belnap Machinery Company

The Rudel-Belnap Machinery Company, Limited, is the name of a new firm which commenced operations on July 1st with office at 505 to 508 Canadian Express building, Montreal. In addition to handling a great variety of machinery suitable for milling, mining, machine shops, railway contractors, etc., this firm will represent the Canadian Crocker-Wheeler Co., Limited, of St. Catharines, Ontario. The heads of the new firm are: Mr. C. M. Rudel and Mr. L. J. Belnap. Mr. Rudel was formerly proprietor of the Rudel-Yeates Machinery Company of Montreal and previous to that was manager of The Canadian Fairbanks Company in Montreal. Mr. Belnap has been for the last ten years connected with the Allis-Chalmers-Bullock Company, Limited, first as engineer at Montreal, then as manager of the Winnipeg office for several years, and latterly as the Montreal manager. During his connection with this company Mr. Belnap has had a wide experience in mechanical engineering, a large proportion of that com-

pany's work being the construction of machinery not intended for electrical purposes. Mr. Belnap has been engaged in engineering enterprises for over fifteen years and as a consequence is eminently fitted for the position he occupies as a member of the new firm.

ABolites

A new line of Universal Holder Sockets has recently been developed and patented by Mr. W. C. Hine of Cleveland, from whom the Adams-Bagnall Electric Company of that city have secured exclusive license to manufacture and sell these articles, to which the trade name "ABolites" has been applied. A short outline of the characteristic features follows:—

To obtain scientific illumination, it is necessary to obtain proper relation between lamp and reflecting surface.

400 and 500 Watt Bowl ABolite

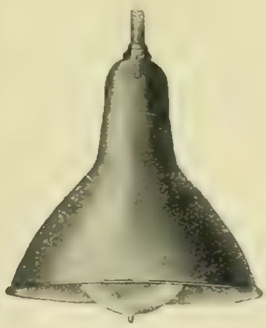
Cross-section 2¼-in Pendant ABolite

On account of different lengths of bases in Mazda lamps, it has been necessary to attach several kinds of separable holders to a regulation Edison socket. The reflector in turn was suspended from the holder.

The primary construction characteristic of the ABolite is the provision of a metal support for a reflector to re-

60 Watt Bowl ABolite

3¼-in. Pendant ABolite



250 Watt Bowl ABolite

place variable holders. To this is applied the cardinal principle of a patented positioning device attached to a suitable porcelain receptacle. When the positioning yoke is thrown downward, the lamps and reflector are in the position obtained by use of "O" holders. When thrown upward, the "H" position is obtained. These two positions or intermediate ones are possible in ABolites designed for reflectors with 2¼ in. fitters, that is for lamps 25 to 100 watt inclusive.

The same principle applies to reflectors with 3¼ in. fitters, i.e., 150 to 500 watt inclusive. Two pendant (2¼ in. and 3¼ in.) and two ceiling (2¼ in. and 3¼ in.) ABolites take care of practically all single light illumination requirements on all lamps 25 watt to 500 watt inclusive. This obviates the necessity of carrying a large and diversified stock of lighting fixtures and accessories.

A complete industrial ABolite is made up of two parts, the universal holder socket and the scientifically designed steel reflector. The following list outlines the features claimed for the industrial ABolite:

(a) Positioning device provides for O, H and A positions. (b) Eliminates all separable holders. (c) One holder

250 Watt 18-in. Dome ABolite

3¼-in. Ceiling ABolite

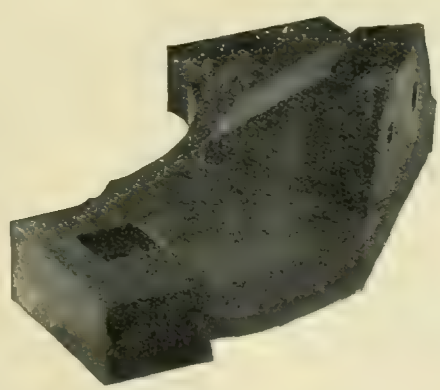
socket universal for all lamps, 25 to 500 watt inclusive. (d) All weight suspended from holder socket itself. (e) Reflector removed for cleaning without breaking any wire connections or disturbing the holder socket already in place. (f) Intensive and extensive illumination obtained with the same ABolite by simply changing positioning device. (g) Larger or smaller units can be substituted for those in place without touching the holder socket already in place.

In connection with this line, the Adams-Bagnall Electric Company has established a department of Efficiency Engineering for the purpose of studying industrial conditions and co-operating with industrial managers in bringing their illumination to a plane where labor efficiency and factory output will be greatly increased.

The work of this department is part of the general efficiency movement just launched, and there should be no doubt that the course taken by this company in the establishment of such a department will do much toward improving general industrial lighting conditions.

New Material for Brush Holder Yokes

Bakelite brush holder yokes bid fair to mark an important advance in the electrical trade. The peculiar properties of Bakelite make it particularly valuable for the purpose, being proof against weather, moisture, oil or acids. Bakelite keeps its shape and, therefore, brush holder yokes made from it cannot twist or warp. In the manufacture of the yokes the metal parts are protected from exposure by moulding in one solid piece with brass insets for attaching to motor frame. The many inquiries for Bakelite yokes

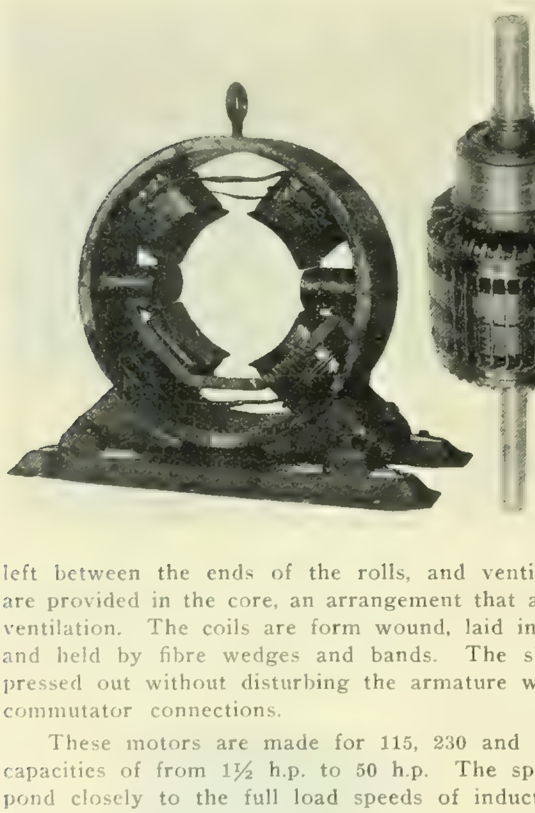


since their announcement is significant of the interest which is felt everywhere in this useful material and its value to the electrical industry. It is claimed that Bakelite has one of the most brilliant futures of any invention that has recently appeared in the electrical world.

A New Direct Current Motor

The Westinghouse Electric and Manufacturing Company have announced a new direct-current motor called Type SK for general power service. One of the features of this new motor is its excellent commutation, which is obtained, partly by the use of commutating poles and partly by the careful design of commutator, brushes, and brushholders. Service tests have shown practically sparkless commutation under all conditions of speed or load up to extreme overloads. Another characteristic of importance is the large dust-proof bearings, and the efficiency of the oiling system. Large oil rings keep the bearing surfaces well lubricated whenever the motor is in operation, but the oil cannot leak or be thrown out of the well.

As can be seen from the accompaning illustrations, the motor is very simple in construction. The frame is of new design, a ring of open-hearth steel made by hot-rolling the slab into shape and welding the ends together. Rolled steel is an ideal material for motor frames because of its high magnetic permeability, uniform structure and great strength. The feet are pressed from steel plate and are riveted under great pressure, making a very rigid construction. The armature is so wound that wide spaces are



left between the ends of the rolls, and ventilating ducts are provided in the core, an arrangement that assures good ventilation. The coils are form wound, laid in open slots, and held by fibre wedges and bands. The shaft can be pressed out without disturbing the armature windings and commutator connections.

These motors are made for 115, 230 and 550 volts in capacities of from 1½ h.p. to 50 h.p. The speeds correspond closely to the full load speeds of induction motors, thus simplifing the application of motors and making changes from motors of one class to those of another comparatively easy.

Trade Publications

Motor Drive for Printing Machinery.—Bulletin No. 127, issued by the Canadian Crocker Wheeler Co., St. Catharines, descriptive of the various applications of motor drives to printing and binding machinery in all its forms. Well illustrated.

National Electric Lamp Association,—have just issued bulletins 16 and 17 descriptive of Mazda Incandescent Street Lighting and Economical Operation of Incandescent Lamps, from the standpoint of both consumer and central station.

Grinding Wheels,—A little booklet entitled "Safety as applied to Grinding Wheels," issued by the Norton Company, Worcester, Mass.

Table Cooking, by Electricity,—A folder issued by the Canadian Westinghouse Company, Hamilton, illustrating various cooking utensils suitable for use right on your dining-table.

Portable Meters.—Circular 1104 issued by the Canadian Westinghouse Company, Hamilton, descriptive of their various types of portable meters for alternating and direct current. The internal structure of the meters is very clearly shown by excellent illustrations.

The Federalist,—The August issue of a publication distributed monthly by the Federal Electric Company of Chicago, descriptive of their various electrical supplies.

The Garvin Machine Co.,—an illustrated catalogue by this company descriptive of machinery manufactured by them including profiling, milling, grinding, tapping, drilling, &c., &c., machines. Head office, New York.

Canadian General Electric Co.,—condulet talk, series 2, No. 1, descriptive of condulets for electroliers and combination gas and electric fixtures. Also sheet descriptive of new twin disc hot plate. Letter No. 213 describing G. E. attaching plugs, and letter 214 descriptive of the G. E. special receptacle.

Mazda Transformers,—bulletin No. 1151 issued by the Pittsburg Transformer Company, and descriptive of their low voltage transformers for electric sign and electric bell work.

Canadian General Electric Co.,—Pamphlets descriptive of two dry batteries, Columbia and the Columbia Ignitor; the Oneida Galvanized Chain for arc lamp suspension; letter No. 211 describing the G. E. separable attaching plugs; condulet talks 144 and 145, descriptive of types "D.F." and "Q.K.L." condulets.

The Ohio Brass Co.,—Supplement No. 2 containing additions and improvements on lines listed in the following catalogues:—Railway No. 8, Mine No. 9, Catenary No. 20, O-B Hi-Tension Insulator No. 10.

Securing New Business.—A sectional catolog issued by the Delta-Star Electric Company Chicago, devoted to an exposition of the Pittsburg Weatherproof Transformers for use in securing new business along transmission lines. Recommendations are made as to the best method of installation, lightning protection and grounding of the secondary system. A description is also given of Delta-Star high tension specialties for both indoor and weatherproof mounting.

Thomas Meter Installations.—A booklet issued by the Cutler-Hammer Manufacturing Company, describing some Thomas meter installations and tests. This meter was described recently in the Electrical News.

Revised Editions.—The Westinghouse Elec. & Mfg. Co. have issued revised editions of the following sections of Perpetual Catalogue No. 3001; No. 121 on "Type CC Carbon Circuit Breakers;" No. 231 on "Expulsion Type Fuse Blocks;" No. 233 on "Outdoor Type Fuse Blocks;" No. 327 "Type C Watthour Meters;" and No. 667 on "Type KD Generator and Feeder Panels; No. 307 covers "Types L, SL and TL switchboard meters; No. 310 "Types FM and TM switchboard meters; No. 311 "Type FD and TD Frequency Meters; No. 312 "Types FI and TI Power Factor Meters; No. 314 "Type TG Electrostatic Ground Detectors and Voltmeters; No. 327½ "Type OA Watthour Meters; No. 436 covers "The New Nursery Milk Warmer; No. 740 covers "75 kv.a. and 100 kv.a. Distributing Transformers."

Current News and Notes

Berlin, Ont.
The receipts of the Berlin & Waterloo Electric Railway system for the month of July amounted to $3,483.41; total expenditure, $1,788,86; profits, $1,694.55. V. S. McIntyre is superintendent.

Brandon, Man.
The tender of the Northern Electric & Manufacturing Company for central office fire alarm equipment to cost $3,057, has been accepted.

Calgary, Alta.
Calgary's municipal lighting plant showed a profit of $67,809 for the six months ending June 30. The total receipts have been $128,527; $80,846 of which comes from metered light. During the same period gross earnings of the municipal street railway are $153,446, net earnings $50,171.

Tenders called for pump and electric motor. Owner, City of Calgary; city clerk, W. D. Spence. Supply and erection of pump and electric motor in place of five million imp. gal. pump. The pump to be centrifugal and attached to a 500 h.p. electric motor with switchboard complete. Suction, lift of pump 12 ft., delivery to be continuously efficient to maintain pressure in the mains 125 lbs. per square inch. Tenders received by clerk until August 21st.

Edmonds, B.C.
Permission has been granted by the municipality of Burnaby to the Western Canada Power Company to commence the erection of its poles and wires on the Johnston road, which will enable that vicinity to obtain electric light and power almost immediately. A temporary line will be put in to be followed later by a steel tower line on a private right-of-way.

Edmonton, Alta.
The Edmonton Portland Cement Co. has awarded the contract for a 1250 kw., 3-phase, 60 cycle, turbo-generator set to the Allis-Chalmers-Bullock Co. The boilers will be supplied by Goldie & McCulloch.

New negotiations opened for power development. Owner, City of Edmonton. City Engineer, A. T. Latornell. Another company backed by English syndicate after water rights at Grand Rapids. Plans have been prepared by Mr. Neville, C. E., Edmonton.

Foster, Que.
The Brome Lake Electric Light Co. are about to make some extensive repairs at their plant here, and will begin work at once. The power for lighting Foster will be supplied from Waterloo, while the repairs are being made.

Goderich, Ont.
The ratepayers of Goderich voted on August 19 on a proposal by Mr. Brodie, of London, Eng., to supply power for the municipal electric light and waterworks plant at $34 per horse-power, the town to take 325 horse power at this price, and sell any surplus over its own requirements in lots of less than five horse power. The factories using a larger amount of power may contract directly with Mr. Brodie, who is to generate the power in connection with a large salt plant he proposes to erect here.

Grimsby, Ont.
A by-law will be submitted on the 31st of August for raising, by debentures, the sum of $10,000 as a loan to aid the Radiant Electric Company, Ltd., of Grimsby, in establishing and carrying on the manufacture of electric appliances of all kinds.

Guelph, Ont.
The Flexible Conduit Company, Ltd., Guelph, Ont., has been incorporated with a capital stock of $50,000, to manufacture and deal in textile materials, conduits, cables and other electric supplies. Provisional directors include Geo. Edmund Courtice, of Clinton, Ont., Jas. Ernest Carter and John McPherson Taylor, both of Guelph.

Halifax, N.S.
The Halifax Electric Tramway Co. will construct half a mile of car line on Pleasant street, estimated cost, $5,000.

Hamilton, Ont.
By a vote of 3663 to 3224 this city voted to spend some half million dollars on a municipal plant to use power supplied by the Ontario Hydro-electric Commission.

Kamloops, B.C.
According to a reported statement of Mayor Robinson, of this city, the municipality will shortly commence operations on the construction of a 5,000 h.p. hydro-electric plant on the Barrier river, a tributary of the North Thompson river, at a point about 40 miles from Kamloops. Engineer R. S. Lea is acting for the municipality.

London, Ont.
It is proposed to install ornamental lighting standards and underground lead wires at an additional cost of about $170,000. The question of having all telegraph wires placed in conduit is again under consideration.

Mr. A. E. Welch, representing the North Midland Electric Railroad, states that the final arrangements have been made in connection with the construction of a branch line of their road to St. Mary's. The route is not definitely settled, but will probably be from London to St. Mary's and Stratford, with branch lines to Granton and other points in this district. The company will build switch lines to all the factories of the town. Hydro-electric power obtained from the St. Mary's sub-station may be used to operate the road. The construction work will, it is stated, be started this fall.

Middleton, N. S.
Equipment required for electric lighting system. Owner, Town of Middleton, N. S. James A. Gates, town clerk. Expenditure of about $15,000 to $20,000 to be made. Ratepayers have voted appropriation.

Mimico, Ont.
This village will vote on September 15 on the question of securing a supply of electric power from the Hydro-electric Commission.

A by-law will be submitted by the council asking power to close a three-year agreement for light and power with the Erindale Power Company.

Moncton, N.B.
The new lighting plant of the I. C. R., installed in the rear of the Intercolonial Elevator, is ready for operation. The equipment consists of a 130 h.p. Robb engine direct connected to a 100 kw. C. G. E. generator.

The Moncton Tramways, Electricity and Gas Company intend starting work at once on the roadbed for the Moncton Street Railway. The company are advertising for one hundred men and a foreman, and the construction of the road is to be rushed.

Montreal, Que.
The town of Verdun have asked the Montreal Street Railway Company to provide cars of modern construction. They are also agitating for a straight city fare.

The town council of St. Lambert has voted funds to provide poles and other equipment for a short length of additional lines. This is in response to further demands by the citizens for more electric light. The work is to be proceeded with at once.

Another attempt has been made by the civic controllers to resume negotiations with the street railway for a new contract. The controllers offer to give any assistance that may be necessary to the company's engineers, either in the way of data or technical knowledge. The city has already furnished the company with a list of streets on which new tramway lines are required, but the president has asked for several weeks' time in order that estimates may be made up of the cost.

Moose Jaw, Sask.
The contract for new electric street lights has been awarded to the Canadian Westinghouse Company at $4,225. The city will also purchase ornamental poles from Dawson & Co. at $85 each.

The installation of the street railway system, under the supervision of Superintendent Dion, is progressing satisfactorily. Mr. Dion is opposed to hastening the work of construction at the expense of efficiency.

Napanee, Ont.
The by-law authorizing the town to sell the municipal electric plant to the Electric Power Co. was carried by a vote of 408 to 46. The town raceives about $40,000, gives the company a 30-year contract and secures electric light at 8 cents net a kilowatt hour.

New Hamburg, Ont.
The Hahn Brass Co. are now running their plant by Hydro-electric power. A fifty horse power motor has been installed and the Niagara power turned on, giving the best of satisfaction. This firm was one of the first to encourage the use of Niagara power in New Hamburg when it was first voted on here and are the first to have it in use for power. This factory is a most

flourishing one, employing a big staff of employees. Their product consists of brass trimmings for furniture. The New Hamburg system was installed by Engineer Merrill, of Toronto, and has given the best of satisfactory service.

Niagara Falls, Ont.

Electric equipment required. Owner, J. Robinson & Sons, Niagara Falls, Ont. Equipment wanted, lathe drill press, sharper electric rectifier; also motor shafting, pulleys, etc. None purchased as yet.

North Bay, Ont.

The town council is busy discussing a proposition recently submitted by the Light & Power Company for the sale of the private plant to the town for $150,000. The Hydro-electric Commission has made a report on the situation and advises the purchase of only the distributing end of the system. The inference is that the Commission will be in a position to supply the power, but as to this the council are apparently quite in the dark.

Oakbank, Man.

By the casting vote of the reeve the council has agreed to grant a twenty years' franchise in the municipality to the Bird's Hill and Springheld Electric Company. While the majority of the residents in the district are in favor of an electric railway, it is doubtful whether they will support the proposal to give such extensive powers as are spoken of. The matter will be put to a vote in the near future.

Orillia, Ont.

Contracts for electrical equipment to the value of $12,250 have been awarded the Westinghouse Co. in connection with power plant and line extensions. Construction work is proceeding rapidly.

Ottawa, Ont.

The St. Lawrence Pulp & Paper Mill recently suffered a severe fire loss, estimated at $20,000.

A company is said to be in process of organization to build and operate an electric railroad between Ottawa and points up the Gatineau River.

A by-law will be submitted during September authorizing the purchase of electric pumping equipment to increase the present capacity and pressure.

The municipal electric light plant has decided to reduce its schedule of charges in September. Mr. Dion, general superintendent of the Ottawa Electric Company, has intimated that his company may reduce its rate of charges also.

At a meeting of the new board of directors of the Morrisburg and Ottawa Electric Railway at their offices, 248½ Albert street, yesterday, the following officers were elected: President, James Oliver; vice-president, Ald. W. J. Campbell; secretary-treasurer, R. A. Bishop. It is hoped work can be commenced this year.

The Inland Revenue Department has granted a license to the Western Canada Power Co., Stave Lake, Ruskin, B.C., for the export of 5,000 kilowatts of electrical energy across the international boundary at Sumas, for the purpose of carrying out a contract made with the Whatcom County Railway & Light Co., which supplies light and power to Bellingham and other towns in the State of Washington.

Peterboro, Ont.

The electric lighting system which has been in the course of installation at the Peterborough hydraulic lift lock is now complete.

Port Arthur, Ont.

The Port Arthur & Fort William Electric Street Railway will extend the Arthur street branch one-half mile.

Portage la Prairie, Man.

An agreement has been arrived at between the Central Electric Company and the city council whereby the city agrees to purchase the complete plant of the private company for $110,000. A by-law ratifying the agreement will be submitted on September 6. In the above-mentioned sum $18,000 is included for goodwill. 24-hour service will be given by the city.

Saskatoon, Sask.

A boiler explosion at the city electric plant on July 27 left the city without power or light temporarily.

A by-law was submitted on August 24, for raising $75,000 for extensions to the electric light and power system of the city.

Sherbrooke, Que.

Work on the municipal plant at Rock Forest, Magog river, is progressing satisfactorily under the personal management of Mr. Beattie, of Morrow & Beattie, the contractors in charge of construction. About 32 foot head will be obtained. Two 1,000 h.p. units, the full capacity, will be installed at once.

Application for franchise power company. Sherbrooke railway and Power Co. have purchased The North Hatley Electric Light Co. and The Stanstead and Rock Island Light Co. and are now applying to the different municipalities for a franchise for 25 years to sell power and light. Estimated expenditure $75,000. Their object is to furnish power and electric light for a radius of about 30 miles around Sherbrooke.

Simcoe, Ont.

It is probable that a by-law to guarantee bonds of the Port Dover, Simcoe & Brantford Electric Railway will be submitted to the property-owners of Simcoe.

Stettler, Alta.

The Farmer's Rural Telephone System is being enlarged. C. Lincoln, Stettler, manager.

Ste. Anne de Bellevue, Que.

Tenders were called on the 14th for the installation of an electric lighting system for above municipality.

St. Jerome, Que.

Tenders called for power system. Owner, Municipality of St. Jerome; consulting engineer, DeGaspe Beaubien, 112 St. James street, Montreal. Complete hydro-electric power and distribution system. Tenders received until noon, August 28th.

St. Thomas, Ont.

Port Stanley ratepayers on August 9 carried a by-law to raise $12,750 for the purpose of purchasing Walter Mitchell's electric light plant and installing Hydro-electric light and power distribution plant. The vote was 174 for and two against. Of the amount voted $6,875 goes to Mr. Mitchell as the purchase price of his plant. A transmission line, 13,200 volts, will connect the Port with St. Thomas, a distance of some ten miles.

Sydney, C.B.I.

The Department of Railways has decided to install a new and improved lighting system at the I. C. R. station here, and will begin such installation shortly.

Thamesford.

A large meeting of the citizens of this village and the surrounding district, including Kintore (six miles north of the village), was held in the town hall recently for the final consideration of

Condensed Department

RATES

Positions Wanted, Positions Vacant, Miscellaneous. — 2 cents a word and 25 cents for a heading, per insertion.

Tender advertisements, equipment for sale, etc., 15 cents per agate line (14 agate lines make one inch) per insertion.

Advertisers who wish to conceal their identity may do so by using an Electrical News box number without extra charge.

Forms close on the 18th of each month.

Positions Wanted

POSITION WANTED—As Electrical Engineer, Superintendent or Manager of an Electrical Supply System. First-class experience in constructional work, Central Station operation and outside high and low tension work, also in Estimating and Commercial work. Address Box No. 317, Electrical News, Toronto, Ont. 9-10

AGENCIES WANTED

Two young men with sound practical knowledge of general engineering, mechanical and electrical, with first-class connection in Western Canada, want representation of one or two first-class houses in general electrical and mechanical engineering lines. Are hustlers and can show results. Address, Electrical, Box 2727, Winnipeg, Man. 9-9

FOR SALE

Complete set of dies for punch clip. Knife Switches from 25 to 100 amp. Used only a few months. Cost $5,000. Will sell for $1,500. For further information address Box 313, Electrical News, Toronto, Ont. 9-9

taking Hydro-electric power. There was a unanimous vote in favor of the project.

Toronto, Ont.

Good progress is being made with the municipal street railway extensions, and equipment will be required immediately.

It is proposed to light the new steel bridge over the Don river at Queen st. with clusters and ornamental standards like the down-town districts.

The Hydro-electric Commission is making arrangements to carry a temporary line across the Eastern Gap to the filtration plant pumping station on the island to serve until proper authority is obtained from the government and construction work can be commenced on the permanent line.

Vancouver, B.C.

The Northern Light, Power & Coal Company, of Dawson City, Yukon Territory, is reported to have been taken over by a new $8,000,000 British mining syndicate.

City Electrician McCrossan has expressed his opinion that arc lights, two to each standard, owing to lower operating costs, are the most preferable form of street illumination.

The British Columbia Electric Railway Co. has awarded the contract for the construction of a new freight shed at the foot of Carrall street near False Creek, to D. Mathewson, of this city.

The city and the B. C. E. R. Co. are working on an agreement for improvements and extensions, the basis of which shall be an extension of all franchises to December 31, 1935. One clause of the agreement provides that the company shall spend $5,000,000 within five years.

Commencing August 1 the B. C. E. R. Co. has established a freight service on the new Burnaby line for the convenience of the residents on that line. At the outset there will be one train per day, leaving New Westminster at 8.30 a.m. and Vancouver at 10.30 a.m.

A fine electrical display is promised for the coming Vancouver Exhibition. Arrangements have just been completed by the Exhibition Association with the B. C. E. R. Co. for supplying the power needed to light up the entire grounds during the week of the big fall gathering. Every building on the grounds will be outlined with lights. It is estimated over 15,000 incandescent lights will be needed to carry out the plans of the association.

Vernon, B.C.

A further effort will be made to induce the Couteau Power Company to begin work on the Shuswap Falls development. Failing this a combination of municipalities, including Vernon, Kelowna, Armstrong and other towns along the valley may be formed to finance the scheme.

Victoria, B.C.

The contract for wiring the new B. C. Electric Railway station, which is to be built at the corner of Carroll and Hastings, by McDonald & Wilson, has been awarded to Mather, Yuill & Co., Ltd., 429 Pender street west.

Weston, Ont.

The transmission line between Port Credit sub-station and Weston is completed and satisfactory tests were made at the new pumping station on July 25.

Wilkie, Sask.

The following electrical equipment will be installed in the new power plant: One 60 kw., 3-phase, 60 cycle, 2200 volt a.c. generator; one exciter for above; one marble switchboard, instruments and switches; three 2200 volt motors geared to pumps; five transformers for lighting system; series tungsten lighting system for streets.

Winnipeg, Man.

Tenders will be received up to 11 a.m. on Monday, August 28th, 1911, for the manufacture, delivery and installation of underground cable for the Electrical Distribution System of this city.

Plans being prepared for telephone exchange, $50,000, East Main street. Owner, Bell Telephone Co., Montreal; architect, company's architect. Steel and brick, stone foundation.

Tenders called for six potential regulators. Owner, City of Winnipeg. Sec. Board of Control, M. Peterson, City Hall, Winnipeg. Specifications at office of Power Construction Department, Carnegie Library building, Winnipeg. Tenders received by Chairman Board of Control, until 11 a.m. August 22nd.

Mr. Charles Chamberlain, representing the Great Falls Power Company, is negotiating with the city of Winnipeg for the purchase of 20,000 h.p. of electrical energy. This power Mr. Chamberlain purposes distributing among Portage la Prairie, Brandon, Neepawa, Stonewall, Selkirk, and other municipalities and towns in that district.

Toronto, Ont.

Electrical News

Generation, Transmission and Application of Electricity

PUBLISHED MONTHLY BY

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ADVERTISEMENTS.

Orders for advertising should reach the office of publication not later than the 20th day of the month preceding date of issue. Changes in advertisements will be made whenever desired, without cost to the advertiser.

SUBSCRIPTIONS.

The "Electrical News" will be mailed to subscribers in Canada and Great Britain, post free, for $1.00 per annum. United States and foreign, $2.00. Remit by currency, registered letter, or postal order payable to Hugh C. MacLean, Limited.

Subscribers are requested to promptly notify the publishers of failure or delay in delivery of paper.

Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 21 Toronto, October, 1911 No. 10

Central Station Publicity

It too often happens in the smaller towns and municipalities that the central station manager does not make any effort to place his prospective customers in touch with his rates and terms for supplying power and light, forms of contracts and so on. The result is that there is apt to grow up in the minds of these persons a lot of erroneous ideas which tend to operate against the extension of the company's business. It is a very common occurence to find that even regular customers have no idea of the rates they are paying and may be receiving a special rate, or may be paying smaller bills than other towns similarly situated, without being aware of the facts. This is all too evidently a mistake on the part of the central station man. His business of all businesses will surely best bear the light of exposure, for there is no business under the sun for which better value is given for the money received than in the average electric light and power central station.

We are just in receipt of a little booklet published by the Walkerville Light & Power Company, Limited, in which this company has taken its customers and prospective customers into its confidence in a very satisfactory manner. Apparently everything is told the customer that he could possibly be interested in knowing. No secret is made of the fact that the business is operated in a systematic manner and that certain rules and regulations are observed in the making of contracts and in the carrying out of the same. It is explained that there are different forms of contracts for both light and power. These are explained at length, each one in its proper place. Sample forms of application which customers are required to fill in, applicable to each form of contract are enclosed in this booklet. On the whole the general impression created by the booklet is that this company is in the field to do business, that they are willing, and anxious to extend their business on fair terms, and that they stand ready at all times to meet their customers half way in any proposition the customer may have to offer.

We commend this plan very highly to central stations, which may be operating without any form of publicity literature. The central station must advertise what it has to sell, just as any other merchant with goods to dispose of, must advertise, and the spectacle of a central station sitting down to wait for customers, to wait for enquiries as to rates, to wait to be asked for expressions of opinion on the value of electric irons, electric fans, etc., etc., is one that should not be seen in the year 1911 A.D.

Independent Long Distance Lines

The problem of independent telephony in Canada at the present day, as it is and has been since the inception of the independent idea, one of long distance connections, will only be solved when the independent companies are linked together by long distance lines from one end of the continent to the other. Long distance service really constitutes such an important advantage possessed by the Bell Telephone Company that it appears to be a practical impossibility for independent telephone companies with such a handicap to make proper headway against this great monopoly.

In the past, unfortunately, the telephone situation, both in Canada and the United States, has developed into a fight between the Bell interests and the Independent Companies, which have been more or less combined for defensive and protective purposes. Altogether too much time has been lost, however, by the Independent companies, in saying hard things about the Bell Company, in finding fault with their service and in prophesying the down-fall of the enemy in the near future. It would have been ever so much better if the Independent companies had mapped out a definite policy of extensions, looking to the inter-connection of all the numerous units throughout the Dominion, with a view not to kill out the present service of the Bell Company, but to improve on it by supplementing it.

There does not seem to be any doubt that the existence of duplicate telephone systems, in so far as they increase facilities for carrying on telephone business, are justifiable. It is no doubt open to question whether two telephone companies operating in the same town or city will ever give a satisfactory service, on account of the necessary duplication of telephones which every business man must have on his desk, but there seems to be two distinct fields in telephone operation in Canada and the United States, only one of which has been covered by the Bell Company, namely the city and town field. The other field, including the rural population, the smaller towns and villages, has been left pretty exclusively by the Bell Company to the Independents.

But country life and requirements have changed in the last few years. It has become an essential to the carrying on of rural business, that men of one municipality should be able to communicate directly with men of another municipality. It has become necessary now to have long distance lines connecting the various Independent companies. In the near future, if it is not the case at the present moment, it will be an absolute necessity that these rural companies should connect with the larger centres where the Bell Company now monopolize the field. This, however, will be an increase in telephone requirements, a development of telephone service which the Bell Telephone Company's equip-

ment is not at present able to handle, and so will be a legitimate development of the Independent idea. How connection will be made between the Independent companies and the Bell Telephone Company subscribers, in (say) a city like Toronto, is a matter that should work out without great difficulty in the hands of a competent committee of arbitrators, but up to this point it seems perfectly clear that the two fields of the Bell and Independent are clear-cut and do not to any extent overlap.

It would seem to be the part of wisdom then, if the Independent companies would formulate a plan of extension, looking to the probable universal development of the Independent systems in rural sections and their interconnection in the years to come. Such a plan might be drawn up by a committee of experts appointed by the Independent Association, or it may be the work of one man, if a capable man could be obtained for the sum of money likely to be placed at the disposal of the association for this work. A similar idea is being worked out at the present time in the United States. A few days ago entrance was made into Chicago by rural lines connecting two counties outside of the city. By October 7 it is expected that a score or more of prominent Independent companies in the neighborhood of Chicago will have entrance to that city. In Chicago, it will be remembered, there is already the nucleus of a very large Independent company with 23,000 subscribers, and 37,000 additional applications ready to sign up as soon as the machines can be installed. It looks at the present moment as if the United States would shortly be covered by another long distance telephone system, not competing with the others to any extent, not necessarily fighting or trying to hurt the others, but each doing its own legitimate business in its own separate field. That a similar policy is applicable to Canada, there does not seem to be any good reason to doubt.

International Joint Commission

The announcement of the names of the members of the Canadian section of the new International Joint Commission recently made by the Canadian government constitutes the last act in the agreement entered into some two years ago, between the United States and Canada by which all questions relative to the boundary waters between the two countries should be referred to such a body.

The members of the Canadian section are Sir Geo. Gibbons, London, Ont., chairman; Mr. Aime Geoffrion, K.C., Montreal, and Mr. A. B. Barnhill, K.C., St. John, N.B.; Mr. Thos. Cote, Ottawa, is secretary. The members of the United States section are Mr. Thos. H. Carter, Mr. Jas. Tawney, Mr. Frank S. Streeter. Mr. L. White Busbey is secretary.

Now that this commission may be said to have commenced operations a brief outline of the agreement between the two countries and of the duties of the commission will be of interest. The two countries agree to establish and maintain an International Joint Commission, composed of six members, three from each country, and this commission shall have powers "regarding the use of boundary waters and to settle all questions which are now pending between the United States and the Dominion of Canada involving the rights, obligations or interests of either in relation to the other along their common frontier and to make provision for the adjustment and settlement of all such questions as may herewith arise." Boundary waters are defined as the waters from main shore to main shore of the lakes and rivers, and connecting waterways, or the portions thereof, along which the international boundary between the United States and the Dominion of Canada passes, including all bays, arms, and inlets thereof, but not including tributary waters which in their natural channels would flow into such lakes, rivers, and waterways, or waters flowing from such lakes, rivers and waterways, or the waters of rivers flowing across the boundary. By the treaty it is agreed that the navigation of all navigable boundary waters shall forever continue free and open for the purpose of commerce to each country alike.

It is also agreed that each country reserves to itself the exclusive control over the use and diversion of waters on its own side of the line which in their natural channels would flow across the boundary or into boundary water.

The treaty mentions the expediency of limiting the diversion of waters from the Niagara River, so that the level of Lake Erie will not be appreciably affected. The desire is expressed, however, to accomplish this object with the least possible injury to existing investments. The United States may permit a diversion from the river not exceeding 20,000 cubic feet per second. Canada may divert not exceeding 36,000 cubic feet per second. These prohibitions do not include the diversion of water for sanitary or domestic purposes or for the service of canals for purposes of navigation.

In the treaty it is also agreed that the St. Mary and Milk rivers and their tributaries (in the State of Montana and the provinces of Alberta and Saskatchewan) are to be apportioned equally between the two countries.

In addition to questions which may arise in connection with navigation or water diversions, the commission have power to examine and report on any matters which may arise involving the rights, obligations, or interests of either country, in relation to the other, along the common frontier between the United States and the Dominion of Canada. Such reports, however, shall not be regarded as decisions on the matters so submitted, and shall not have the character of an arbitral award.

It is also provided in the treaty that any other matters of difference between the two countries involving the rights, obligations or interests of either, in relation to the other may be referred for decision to the International Joint Commission by the consent of the two parties, a majority of the Commission having power to render a decision. In the event of the Commission being equally divided on a question so referred to them, it shall be their duty to make a joint report, after which an umpire shall be chosen by the two countries, in accordance with the procedure prescribed at The Hague Convention in 1907, which umpire shall have power to render a final decision with respect to the matter so referred to him.

Canadian Electrical Association

A meeting of the Managing Committee of the Canadian Electrical Association was held at the Engineers' Club, Toronto, on September 6th, when eighty-two applications for membership were accepted.

A communication was presented from Mr. Herbert Baker, Secretary of the Publicity and Industrial Bureau of Ottawa, extending an invitation to hold next year's convention in that city, and pointing out that by next year Ottawa would be in a position to provide the finest hotel accommodation in Canada. Invitations were also received from the Mayors of Fort William and Port Arthur and other officials of these cities to hold the convention at the head of the lakes. The committee voted in favor of Ottawa, which has not had a C. E. A. convention for ten years. The convention will likely be held in the month of June, and owing to the fact that the N. E. L. A. conven-

tion will be held in Seattle, there will undoubtedly be a very large attendance not only from Canada but also the Eastern States.

Mr. R. G. Black was appointed Chairman of the Papers Committee.

It is expected that the various Provincial Committees which have been appointed will immediately undertake a campaign for new members, and a special committee of the Executive was appointed to co-operate with the Provincial Committees.

The following committees were appointed: Committee on Public Policy; Committee on Uniform Accounting; Meter Committee; Committee on Standardization of Line Construction; Commercial Committee; Committee on Rates and Forms of Contract.

A Novel Use for Telephones

A submarine telephone line was used for the first time in history in connection with the handicapping of speedy motor boats by the Canadian National Exhibition Race Committee at the motor boat races held off Exhibition Park at Toronto, Canada, September 4th to 9th.

The races held last year were somewhat unsatisfactory to both the spectators and the participants owing to the inadequate system of signalling and timing. Flags were the principal means of conveying information and these were very frequently obscured by the smoke of passing steamers and the dull haze which hung over the water. Confusion of the signals and debates between the boat owners and officials plainly indicated the need of a quick and positive means of communication.

Telephone Equipment at Dufferin St. Wharf.

It is safe to say that the races this year were the best that the Exhibition has ever known. Every boat was supplied with a numbered burgee and a large bulletin board on the old Dufferin street wharf informed the drivers of the competing craft of their proper position in starting. Almost all of the races were handicaps; these handicaps were decided by the time taken in running the various boats over a measured mile course.

To accurately measure the elapsed time a submarine telephone line was laid between the Dufferin street wharf and a scow anchored a mile out in the lake, this being the first buoy. Major S. A. Sylvester of the Toronto Motor Boat Club was seated on the scow provided with a stop watch and gun. As each boat crossed the line he fired his gun and at the same time operated with stop watch. At the other end of the telephone on the wharf Captain J. P. Beatty sat with the receiver to his ear; he heard the report of the gun instantly and started his watch, stopping it as the boat passed him. This method gave a double check on the elapsed time and the results obtained were so accurate that in no case did they check a fifth of a second out.

Timing at First Bouy.

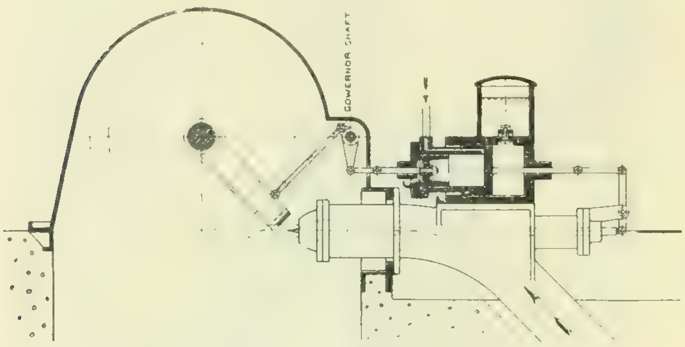
The wire used for the submarine line was of No. 18 B.W.G. wire provided with double impregnated braiding twisted in a pair. The instruments were two standard series magneto desk telephones specially equipped with an operator's headband receiver so as to allow the timers to use both hands. No trouble whatsoever was experienced in relation to either the instruments or the wire not-

withstanding the fact that they were exposed continually to the action of the elements throughout the period of the race.

This installation was engineered and constructed by the Stromberg-Carlson Telephone Manufacturing Company in conjunction with Mr. George J. Beattie as electrical contractor.

New Regulator for Impulse Turbines

The cut shown herewith illustrates a new device recently put into successful operation on a number of high head plants, on the Continent, by the Jens Orten-Boving Company. Under ordinary conditions where high head impulse wheels have been installed, water is deflected against these wheels by a nozzle, which is movable in position up or down depending on the amount of power required. The Boving patent consists of a deflector, as shown in the cut, which moves concentrically with the wheel and cuts into the jet from above. When the full force of the



The Boving Turbine Pressure Regulator.

jet is required the deflector is raised above the stream. In the above figure the deflector is shown, rigidly connected to the automatic governor. Among the many advantages claimed for this regulator is that the deflector can act instantaneously, which motion is followed by the slow closing of the needle, thus preventing all shocks. It also allows of the rigid installation of the nozzle, a factor of importance where the force is great.

Transmission Line Design

The accompanying photographs illustrate phases of the construction of the distribution system of the Seymour Power & Electric Company, a subsidiary of the Electric Power Company.

Figure number 1 is a right angle turn on the 44,000 volt transmission line of this company, near Cobourg. Three-piece porcelain insulators are used, diameter of top shell being 12-in., and total height of insulator 11⅝ in. Cast iron cone shaped pin is used, through the centre of which runs a ¾-in. steel stud, one end of which is threaded to fit a cast iron thimble which is cemented into the inner shell of the insulator. At all corners where the poles are double armed, double arming plates are used as shown in illustration. These consist of steel plates 24 inches long by 4 in. wide, ⅜ in. thick, and are bolted above and below the ends of each pair of cross arms. This pair of plates forms a very substantial support for the high tension insulator pin. ¾-in. machine bolts and angle iron braces are used for securing cross arms to the post. The line conductor consists of No. 0000, 7 strand, bare aluminum. The line is protected from lightning by ¼-in., 7-strand galvanized steel wire, carried over the top of the poles on pressed steel ground wire supports. The overhead wire is grounded every second pole. Telephone circuit consists of a pair of No. 9 B.W.G. galvanized steel wires.

Figure 2 illustrates the new sub-station recently erected at Cobourg for the supply of power by the Seymour Power

Fig. 1

& Electric Company to the Cobourg Utilities Company. The present installation in this sub-station consists of two 750 kv.a., 60 cycle, 3-phase, oil insulated, water cooled transformers to step down from 44,000 to 2,400 volts, space being left in the sub-station for the installation of a third transformer of the same size. The horn gap switches for lightning arresters, choke coils and all high tension disconnecting switches are mounted either on top of the sub-station or on pole structures outside, allowing a very much smaller building to be used than would otherwise be neces-

Fig. 2

sary. The apparatus in this sub-station is protected by means of a three-pole single throw 44,000 volt oil switch with time limit overload relay; also by means of a set of aluminum cell lightning arresters.

At a recent meeting of the town council of Brockville a communication was read from Mr. W. D. V. Earle, local manager of the Bell Telephone Company, asking permission to place their wires underground along certain portions of King street. The application was granted, proviso being inserted that the company should be liable for any damage that may occur during the work.

The Makers of Electrical Canada—10

CECIL BRUNSWICK SMITH — PROMOTER-ENGINEER

It is probably safe to say that no Canadian engineer of the present day has had so varied an experience in all the branches of engineering—civil, mechanical, electrical (and financial), as Mr. Cecil B. Smith, the senior member of the firm of Smith, Kerry & Chace. After graduation from McGill, in 1884, at the age of 19, where he carried off the Governor-General's medal, he was first connected as resident engineer with the N. P. & T. Railway, Ontario. After two years he became resident engineer of the St. Catharines and N. C. Railway, St. Catharines, Ontario, and in the two decades following 1887 up to the formation of the firm of which he is now the head, filled with honor the following responsible positions: resident engineer, C. P. R. at London; locating engineer T. H. & B., Hamilton; divisional engineer C. C. & C. Ry., Johnstone City, Tenn.; chief assistant engineer Roanoke & Southern Ry., N.C.; assistant engineer B. & O. Ry., Morganstown, Va.; assistant professor, civil engineering, McGill University, Montreal, 1893 to 1898; locating engineer C.P.R.; asst. engineer city of Toronto; engineer of construction, Can. Niagara Power Co., 1901 to 1905. In 1905 he was appointed chairman of, and consulting engineer to, the T. & N. O. Railway Commission. This position of consultant he retained until the first of the present year, but relinquished the chairmanship after two years in 1907.

MR. CECIL B. SMITH, Ma. E., B. Sc.

It was in 1905 also that the Ontario Government finally determined to carry out its scheme of power distribution throughout Western Ontario, and Mr. Smith was appointed chief engineer. During the two following years, 1905-1907 in which the policy of the Commission was definitely formulated and the construction plans of this big transmission system prepared, Mr. Smith was the chief engineering influence behind the work and in the distribution of credit for the final ultimate success of this new world-renowned plant no small share belongs to the man who blazed the trail and laid the solid foundation.

Since 1907 one cannot separate the work of Mr. Smith from that of his firm, now so widely known by its operations, not only in Canada but, latterly also, at different points in the United States. In Canada the firm is perhaps best known as the promoters, designers, constructors and now, operators of the Electric Power Company, a merger of some ten or twelve good sized electric generating and distributing companies dotted over Central Ontario. These have been unified into one magnificent system by inter-connecting high tension transmission lines; the construction, machinery and operation of the various units have been standardized and in the near future when the present generous construction plans of this company shall have been completed all the central portion of Ontario will be amply supplied with electric light and power furnished by a monopoly possessing all the modern facilities for excellence and continuity of service, coupled with an evident desire to serve its constituents with businesslike fairness, as being in the best interests of both company and customer.

Other works with which this firm have been more or less intimately connected, in addition to designing and construction, include the plant now owned by the British Canadian Power Co. on the Matabitchouan River, which serves the Cobalt district, and the generating and transmission works of the Calgary Power Co. on the Bow River, 45 miles out from Calgary. They were also consulting and constructing engineers for the new steam plant at Lethbridge and the hydro-electric plants at Nelson and Revelstoke, B. C., and at the present time are just completing the construction of the 60,000 h.p. plant with the necessary transmission and distributing system for the city of Winnipeg. The firm was also associated with the F. H. McGuigan Construction Co. in a contract for the construction of approximately 300 miles of 110,000 volt transmission lines for the Ontario Government.

At the present moment Mr. Smith has his head quarters in Portland, Oregon, where his firm is constructing a 24,000 h.p. hydro-electric plant and 30 miles of electric railway for the Mount Hood Railway and Power Company. Another large United States enterprise in which Mr. Smith is both professionally and financially interested is the Crane Falls Power & Irrigation Company, Idaho.

It is generally understood that Mr. Smith retains a financial interest in many of the enterprises which his initiative and energy bring to a successful condition and for which his firm acts as consultant and constructors. This no doubt is due to a characteristic confidence in his own ability which leads him to have faith in the earning capacity of any plant which he has succeeded in financing and that has been constructed under his firm's supervision. To all appearance this faith has been well founded. His ability as a director and financier is attested also, in part,

of the numerous public utility offices he holds, or has held, including managing director Calgary Power Company, president Nipissing Power Company, president Crane Falls Power & Irrigation Company, 2nd vice-president and general manager Mount Hood Railway & Power Company, and director Portland Cement Company, Portland, Oregon.

Mr. Smith has always been a staunch supporter of the Canadian Society of Civil Engineers to which he has given much, both in papers and time. He is also a member of the Institute of Civil Engineers of Great Britain, the American Society of Civil Engineers, the Oregon Society of Civil Engineers, the Engineer's Club, Toronto, and the Commercial Club, Portland, Ore. He is also a past president of the Toronto Club and past vice-president of the Canadian Society of Civil Engineers. He is a Hamilton Collegiate Institute old boy and was born at Winona, Ont.

A Decade's Progress in U. S.

The Census Bureau of the Department of Commerce and Labor, Washington, has just issued a report dealing with the manufacture of electrical machinery and apparatus

ELECTRICAL MACHINERY, APPARATUS AND SUPPLIES—PRODUCTS, BY KIND, QUANTITY, AND VALUE. 1909, 1904, AND 1899.

ITEMS.	1909	1904	1899
Number of establishments	[1] 1,255	[1] 912	[1] 581
Total value of products	$243,967,000	$159,551,000	$105,832,000
Dynamos			
Number	16,791	15,080	10,527
Total kilowatts	1,405,951	996,182	578,124
Value	$13,081,000	$11,084,000	$10,473,000
Dynamotors, motor generators, boosters, rotary converters and double-current generators	$3,155,000	$1,740,000	$380,000
Transformers for light and power	$8,801,000	$4,469,000	$2,963,000
Switchboards, panel boards, cut-out cabinets for light and power	$5,972,000	$3,766,000	$1,847,000
Motors			
For power—			
Number	244,123	79,877	35,604
Horsepower	1,623,677	678,910	515,705
Value	$18,306,000	$13,121,000	$7,551,000
For automobiles—			
Number	2,796	1,819	3,017
Horsepower	12,471	19,907	8,220
Value	$294,000	$153,000	$192,000
For fans—			
Number	199,113	102,535	97,577
Horsepower	178,033	30,796	12,766
Value	$2,451,000	$1,168,000	$1,055,000
For railways, elevators, and miscellaneous services, including supplies and parts—			
Number	58,698	22,112	23,582
Horsepower	859,237	713,399	684,791
Value	$11,036,000	$7,929,000	$10,707,000
Storage batteries, including parts and supplies			
Weight of plates in pounds	23,119,331	16,113,073	(2)
Value	$4,678,000	$2,640,000	$2,560,000
Primary batteries including parts and supplies			
Number	34,333,531	6,023,162	2,654,765
Value	$5,934,000	$1,598,000	$1,119,000
Arc lamps.			
Number	123,543	195,157	158,187
Value	$1,707,000	$1,574,000	$1,828,000
Searchlights, projectors, and focusing lamps	$936,000	$115,000	$226,000
Incandescent lamps			
Carbon filament, gem, tantalum, tungsten lamps	$13,839,000	$[illegible]308,000	$3,442,000
Decorative and miniature lamps, X-ray bulbs, vacuum tubes, etc. (also includes glower lamps and parts, and vacuum and vapor lamps)	$1,876,000	$645,000	$73,000
Sockets, receptacles, bases, etc	$4,522,000	$2,011,000	$594,000
Electric lighting fixtures of all kinds.	$6,128,000	$3,29[illegible],000	$3,751,000
Telegraph apparatus	$1,957,000	$1,111,000	$1,642,000
Telephone apparatus	$15,547,000	$15,864,000	$10,512,000
Insulated wires and cables	$50,[illegible]8,000	$34,520,000	$21,292,000
Electric conduits.	$[illegible]	$2,416,000	$1,066,000
Annunciators—Domestic, hotel, and office	$236,000	$186,000	$225,000
Electric clocks and time mechanisms	$352,000	$374,000	$132,000
Fuses	$1,002,000	$868,000	$595,000
Lightning arresters	$940,000	$587,000	
Rheostats and resistances	$2,675,000	$933,000	$1,187,000
Heating, cooking and welding apparatus	$1,603,000	$396,000	
Electric flatirons	$451,000	(2)	(2)
Electric measuring instruments	$7,800,000	$5,005,000	$1,842,000
Electrical therapeutic apparatus	$1,116,000	$1,037,000	(2)
Magneto-generator apparatus, spark coils, etc	$6,080,000	$678,000	(2)
Electric switches, signals, and attachments	$[illegible]384,000	$1,451,000	$1,130,000
Conduit fittings of all kinds	$1,081,000	$3,525,000	(2)
All other products	$34,[illegible],000	$26,179,000	$15,884,000
Amount received from custom work and repairing	$5,601,000	$2,799,000	$2,064,000

during the decade 1899 to 1909. Comparative figures showing the products, by kind, quantity and value for the years 1899, 1904 and 1909 are tabulated in a table which is given herewith.

Many Uses for Aluminum

Consul Murphy writing from Switzerland in the Daily Consular and Trade Reports says:

"The Swiss control of the aluminum market, which had existed for several years, passed away with the opening of the American factories at Niagara, for neither Switzerland nor France possesses such rich mines of oxide of aluminum and such sources of electrical energy as the United States. Negotiations were begun a year ago with the view of limiting the production of aluminum and keeping up the prices, but owing to the attitude of the American producers, the movement has not been successful up to this time.

Aluminum has become indispensable in the construction of automobiles, dirigible balloons, and aeroplanes. It is employed also in paper decorations and for wrapping purposes. It has been found of enormous advantage also in the textile industry. Combined with silk, it makes a brilliant fabric, which can be given any desired color and which can not be excelled for making ceremonial costumes and theatrical wardrobes. In addition to the ordinary uses, it is also employed in the manufacture of reticules, scarfs, and various articles of use and ornament, and because of the high price of copper it has been largely used as a substitute for that metal in the manufacture of electrical cables.

Renewing Sarnia Plant

The Sarnia Gas and Electric Company have awarded contracts for the entire renewal of their electric light plant. The electric generators will be supplied by the Swedish General Electric Company, through their Canadian agents, Messrs. Kilmer, Pullen & Burnham, Toronto. These will consist of one 500 kv. a. unit which will be direct-connected to a Goldie & McCulloch turbine; one 375 kv.a., 100 r.p.m. engine type machine, and one 187½ kv.a. 450 r.p.m. belted type unit. All generators are 60 cycle, 3 phase, 2200 volt. Three exciter sets will be supplied by the Canadian Westinghouse, and the switch board by the Canadian General Electric Company. Pumps will be supplied by the Dean Steam Pump Company, of Holyoke Mass. These extensions have been rendered necessary by increased demand for light and power. The apparatus will be installed, and in operation, by about Jan. 1.

Victoria Hospital Awards Contracts to C. G. E.

The Victoria Hospital, London, Ont., has awarded the Canadian General Electric Company a contract for a complete switch board equipment including lightning arresters, receiving board from the transformers at 13,000 volts, and the necessary distributing panels for both motor and lighting circuits. The contract also includes one single-phase Mather and Platt turbine pump direct-connected to a 20-horse power motor for water supply; also a single-stage Mather and Platt turbine pump direct-connected to a 7½ horse-poper motor for sewage disposal; also the following list of induction motors.—two 2 horse-power, two 3 horse-power, three 5 horse-power, five 7½ horse-power, one 8 horse-power, three 10 horse-power, and two 15 horse-power. These motors are all intended for operation by hydro-electric current supplied to the hospital at 550 volts.

Municipal Plant for Norwich

The ratepayers of the village of Norwich, Ont., passed a by-law by a majority of 66 on Sept. 15th to raise $8,000 for the purpose of buying out Mr. H. Webster's outside electric lighting equipment and good will, with the intention of running a municipal electric lighting and power business, buying Niagara power from the Hydro-electric Commission of Ontario. About half the sum raised will be paid for that part of the old plant that can be used, the balance to be spent in remodelling it for Hydro power.

Steam Turbines for Smaller Stations

Extracted from a Paper Read before the Mississippi Electrical Association on the Subject of Turbines for Moderate Sized Stations

By Edwin D. Dreyfus

The national trend toward securing efficient production in our industries has long since extended to the modern power station. And here may be found the most carefully planned and executed equipment, achieving not only the economic utilization of materials, but also the efficient application both of manual labor and executive forces. Quite logically, the larger stations were the first to institute these reforms, but now the smaller stations are following closely, and being governed by this same far-reaching influence.

It is very evident therefore that our present needs demand particularly such qualifications as are intrinsically possessed by the steam turbine, that is to say, the most direct conversion of available energy into effective power, which serves to eliminate all possible working parts and wearing surfaces, and thereby results in:—

1—Minimum attendance and supervision;

2—Least cost to supply, operate and maintain, and

3—Economy and convenience in space requirements.

The notable advances in the metropolitan stations in this country have been accomplished almost entirely through the large steam turbine. Not only has the steam consumption been greatly reduced, but these plants require only from one-quarter to one-third the engine-room operating force which would have been necessary for reciprocating machinery. Moreover, and virtually as important is the fact that maintenance expenses have been correspondingly lowered. Therefore, considering also the lower plant investment and fixed charges, the cost of producing power has been very substantially reduced.

While in the smaller stations the advantages of the turbine may not be present to as great a degree, it introduces other economic considerations that should effect an ultimate benefit to the small station comparable with what has been secured in the larger plants.

An adequate division of responsibility characterizes the organization of the large station, so that each and every part of the work is capably and thoroughly performed. The smaller companies are not justified in employing a special engineering staff, such as is maintained by the larger stations, to investigate the performance of the equipment and thus guard against any avoidable decline in efficiency. In the small plant these duties devolve upon the manager or superintendent who, in many cases, has already assumed the responsibility for other departments of the business, including the executive and commercial branches, the neglect of which will, of course, seriously retard the development of the property. Consequently, the objective point should be to provide equipment insuring the greatest immunity from sources of trouble and derangement. These considerations not only explain, but form well-founded reasons for the growing popularity of the small turbine.

Types

The various types of steam turbines are now fairly well known. It may, however, be desirable to discuss them briefly to bring out a few salient facts.

Commercial turbines belong either to the so-termed impulse or to the reaction type, or, as in some cases, combine the features of both. It is still found that the fundamental principles of operation thus designated, are too frequently confused. For example, in either design, the turbine actually combines the action and reaction features. However, an accurate distinction may be made in the following manner:—In the true impulse turbine, all expansion takes place in the stationary nozzles, velocity energy thus provided being imparted to the moving blades. In the reaction turbine, the expansion occurs both in the moving and the stationary elements, transferring a small part of the energy by impulse at the entrance, and the remaining greater part by reactive thrust on the rotating blade at exit. It may easily be perceived that the steam, acting immediately upon the wheel as expansion takes place, will produce the highest economy, and the losses from nozzles to buckets are thus avoided. The best forms of reaction blading, such as the Parsons, really constitute small nozzles in themselves and are, consequently, recognized to be of much higher efficiency than buckets. Nozzle and bucket efficiencies compare approximately as 95—98 per cent. to 75—80 per cent.

In connection with the two turbine systems it is sometimes claimed that the discharge angles in one type may be greater than in another without any difference in efficiency resulting. The error of this statement, while not apparent at first may be shown vividly by the construction of velocity diagrams, proving that the exit velocity loss occurring in either case will be equally affected by the degree of discharge angle employed.

The Parsons Type

The Parsons turbine is the only design utilizing primarily the expansion of steam in the rotating blades, while the Curtis, Rateau and Zoelly are familiar examples of the impulse type.

Another important feature is to be observed in the adaptability of Parsons blading to the drum type rotor, which constitutes a very rigid construction, favoring high rotative speeds. On the other hand, the multi-cellular impulse turbine must necessarily employ thin discs and shafts having a low critical speed. Larger shafts could be adopted for multiple impulse wheels, but the interstage gland and leakage problems would thereby become more serious. The single impulse wheel with multi-stage use of the steam, as more fully described later, is consequently to be favored. There are obvious cases where it proves best to adopt either reaction blading entirely, the straight impulse wheel, or a proper combination of both types, as hitherto noted, and which may be determined by size and working conditions. For large sizes, turbine records indicate that the Parsons design has not only established the highest thermodynamic efficiencies, but has also proven less subject to deterioration in economy in continuous service. This was brought out during the steam turbine discussion at the December, 1910, meeting of the American Society of Mechanical Engineers. A 10,000 kilowatt Westinghouse turbine developed 69 per cent. Rankine cycle efficiency under test and an important build of Parsons turbine abroad was recently reported as showing 68.3 per cent. on efficiency trial. Several tests of Westinghouse turbines, made immediately after installation, and also after a number of years operation and reported by excellent authority, showed no change in economy whatsoever. This may reasonably be expected from the fact that the relative steam velocities in this type are low, minimizing any erosive action,

particularly in the low pressure stages where the moisture content of the steam is high. Moreover, small wear of the blade edges is of no particular importance in this design.

Each of the various types cited above have had their advocates, and their predominance in some sections has been due to a great extent, if not entirely, to trade relations, rather than to any real underlying merits of design; and, if judged from the former standpoint, this ratio will, of course, tend to distort any estimate of their comparative merits. However, a fair impression may be had of their respective importance when a summation is made of the extent of turbine development, both in this country and abroad. From statistics, we find there exists to-day approximately 14,612,000 horse power of Parsons turbines, and about 6,700,000 horse power of all forms of the purely impulse turbine. This immense quantity of power represented by the Parsons turbine is aided in no small way by marine installations for various types of vessels. In this service the turbine is subject to the most exacting demands, and that the Parsons type has fully complied with the requirements, is forcibly shown by its rapid extension in this field, over 6,000,000 horse power having been installed for marine propulsion. In fact its advantages have become so marked that a vast amount of energy has recently been expended in adapting it to marine work. And it is almost unnecessary to remark that its success inaugurates a new epoch in marine practice.

What has preceded applies mainly to units of moderate and large powers. The type of machine demanded for capacities less than 300 kilowatts is quite different, as the most elementary form of turbine is essential. In these small sizes, where the economy may be somewhat sacrificed, as the absolute steam quantities are of no appreciable magnitude, the simplest arrangement, using an impulse wheel, has been adopted. This situation bears a very close relation to the change from triple expansion pumping engines in large waterworks to direct-acting pumps for stations supplying only a small demand. Similarly the fields for the Corliss engine and the small automatic engines, have in general been quite distinct, but naturally turbines do not necessarily have a corresponding line of demarkation.

The small turbine admits of wide departure in construction, and has, therefore, assumed a great variety of designs, most of which were described by Mr. Geo. A. Orrok, in a paper before the American Society of Mechanical Engineers in 1909. Their merits depend for the most part, if not wholly, upon the facility with which they may be adapted to specific requirements and the ease with which substitution of various parts may be made.

Parsons Turbines of Moderate Size

Construction—The rotor consists principally of three drums, of varying diameter, consisting of high, intermediate and low-pressure stages which have all end thrust neutralized by counter-balancing pistons. Pressures at various stages are communicated to the balancing pistons through equalizer passages. Two self-aligning high-speed bearings are used. Steam is controlled by the main admission valve, and to provide for heavy over-loads, steam under full pressure is supplied to a secondary valve. A valuable provision is made to keep the governor valves in a constant vibrating motion, and in this way no friction of rest or sticking of the valves is to be overcome for any change in governor position. Thus the regulation of this turbine has always been above criticism. Water sealing glands positively prevent any inflow of air to the turbine, which would obviously impair the vacuum.

The blading formation and construction is an important feature of the turbine. Probably no other detail of the design has been the subject of such extensive experimentation as has been accorded the blading itself. Various blade shapes and methods of securing them to the rotor and cylinder have been exploited since the early turbines were built. Blading sections and lengths are now made so as to effect an almost ideal expansion of the steam passing through the turbine. In attaching the root of the blade, the problem is remarkably simple, the blade being provided with a small nick in the root and held by the compression forces of the caulked soft steel packing pieces. Under tension test, the blades will fail at some intermediate section before detaching at the root, due to the firm grasp of the packing pieces. Fastening of the blade tips has undoubtedly attracted the greater attention. Where there is a drop of pressure across each row of blades, it is preferable to maintain minimum clearances to reduce steam leakage. Some clearances may be actually beneficial to the economy of the turbine as it provides a passage for the water in the steam, permitting it to flow through without causing hydraulic friction on the tips of the moving blades, a theory advanced by experienced operators of steam turbines. A reinforcement of the outer ends is only necessary for long blades in order to avoid nodal vibration which might be set up by the steam currents, ultimately causing crystallization and failure of the blades. In certain turbines this is accomplished by a "comma" wire lashing which, on being clinched, establishes a stout abuttment between consecutive blades.

Since the turbine cylinder has been made so symmetrical in design, distortion troubles have been removed. Protection on the tips of the blades is, therefore, not only unnecessary, but on the contrary, the naked blade will cause the least injury in event of accidental contact due to any inaccurate adjustment, which is evidently quite a remote possibility in this type of turbine. A ventilated and interrupted rubbing surface is presented, so that the least amount of local heating is produced, thus avoiding any serious damage. Shrouded blades were used as early as 1887, only a few years after the Hon. C. A. Parsons invented the turbine which bears his name. This was attempted primarily to reduce leakages, but any gains that may have resulted were more than neutralized by the increased skin friction. Shrouding is still used in some designs of Parsons turbines, but from actual figures, those thus provided represent not more than five and one-half per cent. of the turbines of this type.

It is indeed very gratifying to observe in connection with the early Parsons turbines built by the Westinghouse Machine Company (from 1896 to 1900) that no radical departure from the original design has been found necessary in capacities ranging from 300 to 1,000 kilowatts for the purpose of improving economies. Some detail changes have of course been made, principally in cylinder construction, to obviate troubles from distortion due to lack of symmetry. By relieving the cylinder of all unnecessary webs and the integral equalizer ports, the cause of the majority of the operating troubles encountered in the first machines have been overcome.

Unusual Incidents

There can be no question but that the intrinsic merits of any apparatus are always brought out more forcibly by unusual events in its history than by its ordinary operation. In this respect, the extreme simplicity of the turbine cannot be better demonstrated than by a case in which a 500 kilowatt low-pressure turbine of a character later described, was placed in service by the customer's own engineering staff, who, besides having never operated a turbine, had never seen one in service or even dismantled. The machine had operated one month before the builder's erecting engineer reached the plant to make an inspection.

He found the turbine in excellent adjustment. It is of additional interest to note that this plant is at a distant Canadian point.

Another extraordinary occurrence is worthy of note. While en route to central Mexico, a car carrying a 1,500 kilowatt turbine was derailed and the machine thrown down a high embankment. It was necessary to build a special spur track to recover the turbine, and after being reloaded and safely carried to destination, it was found that with the exception of damaged lagging, the machine had sustained no injury.

The individual qualities of the turbine were also strongly emphasized in a disastrous fire which occurred in a certain station in the West. In this instance all inflammable parts of the building, including the roof and floors, the latter being thoroughly oil-soaked, were entirely consumed. The heat from this fire was so intense that it destroyed practically all of the engine room equipment, with the exception of the turbines, of which the valve gear, being exposed, was the only part to suffer. The reciprocating engines, which were alongside the turbines, were damaged beyond repair. The short time required to place the two turbines in service speaks for itself, the 500 kilowatt machine requiring ten days and the 1,000 kilowatt unit twelve days from the time of the fire. This included the time necessary to order new parts from the builder's works, 1,600 miles distant, three days being consumed in transit, and the time necessary for fitting up the machines and opening them for inspection, for which purpose temporary rigging was provided. Previous to this, the 500 kilowatt unit had been in operation night and day for 18 months without repair cost. Repair parts to the extent of $1,000 were carried in stock and lost in the fire. In all, the actual cost of repairing both units was about $2,000, which amounted to approximately five per cent. of their cost.

Small Impulse Turbines

A new development, which becomes of especial interest, is an unique type of impulse turbine designed for the generation of small powers. It is mainly in this field that the greatest variations in working pressures are usually found. Hence it is very important that the design admit of wide limits of application and at the same time involve the least changes in construction in order that it may be economically and commercially adaptable to fluctuating requirements. For a fixed capacity and rotative speed, proper dimensions of the rotor and cylinder (exclusive of the nozzles and reversing chambers) may be established in a large degree without definite regard to the actual pressure to be employed. Then for reasonable deviations from the customary pressures, it is necessary only to proportion and arrange the nozzles and reversing chambers to comply, a very small operation compared with work on the entire unit.

Steam pressures require closer consideration in turbine than in reciprocating engine design. Turbines utilize the energy of the steam through dynamic operation; i.e., the development of high velocities which are subsequently absorbed during the passage of steam through the rotating wheel. In the engine the expansive force of the steam is exerted directly upon the piston. It is well to keep this distinction in mind when gauging the merits of the small turbine. Through adiabatic expansion of steam between certain limits, there is a given amount of heat energy released. This heat energy is immediately converted into work upon a receding piston in the steam engine, as just mentioned, while in the turbine it is transformed into velocity energy, which may be shown mathematically in the following manner:—

Kinetic Energy $= H \times 778$ ft. lbs., where $H =$ Available B. t. u. If $V =$ Velocity of issuing jet in feet per second,—then $V^2 \div 2g = H \times 778$, or $V = \sqrt{2g \times 778 \times H} = 223.7 \sqrt{H}$.

In the ideal impulse turbine ,the buckets should travel at one-half the steam velocity. In commercial practice, it may be necessary to depart somewhat from the ideal, and moreover, in order to simplify stage construction, it is desirable to transform the energy in the high velocity steam into mechanical energy in two or more steps with moderate blade speeds. As an illustration, Table I has been prepared to present a general idea of the amount of heat energy available per pound of steam between customary working pressures and temperatures.

TABLE I.—B. T. U. AVAILABLE BETWEEN VARIOUS INITIAL PRESSURES AND 15 LBS. AND ONE LB., ABSOLUTE

Initial Conditions		Final Conditions	
Pressure Lbs. Abs	Temp. Deg F	15 Lbs. Abs Temp. 213° F.	1 Lb. Abs. Temp. 101° F
		B.t.u. Available.	
105	331	142	294
125	334	155	306
145	356	166	315
165	366	177	325
190	377	186	333

Practical examples should prove instructive, both in showing the fundamental features and the elastic arrangement of the "re-entry" type of turbine, which derives its name from the fact that the steam issuing from the wheel is re-directed upon it again by reversing chambers.

Case I.—Working pressures of 100 lbs. initial and 15 lbs. final are assumed. This gives a heat drop of 130 B.t.u. As approximately ten per cent. is lost in nozzle friction, the resultant velocity acting upon the wheel becomes 2,400 ft. per second. Taking a normal blade speed of 500 feet per second and blade angle of 25 degrees, the steam velocity fixes the nozzle angle at 20 degrees. Reducing the relative velocity R_1 for blade friction, the relative velocity R_2 leaving the wheel is found, thus determining the absolute velocity V. The magnitude of the latter shows why it is necessary to provide for repassage of the steam through the wheel. This steam is redirected upon the blades through the reversing chamber, friction decreasing the absolute velocity to 1,200 feet per second, establishing a nozzle angle of 15 degrees. Under these conditions the steam jet issues at right angles to the wheel with a small residual velocity of 250 feet per second, thus reducing the loss from this source to a minimum.

Case II.—Assuming now that the pressure range had been from 135 lbs. to 15 lbs. absolute, the steam is expanded from 135 to 23 lbs. absolute in the first stage. The available heat would still be 130 B.t.u., and therefore, the velocity developed remains the same as above. Then the high pressure nozzle and reversing chambers in both cases will be similar, excepting that in Case II. they will be of less width due to the greater steam density. However, with the pressure of 23 pounds at the end of the first stage, a velocity of 1,200 feet per second may be developed by further expanding to 15 lbs. absolute, which is accomplished by the addition of another nozzle. Had the initial pressure been higher, the residual velocity might have been sufficient to warrant the addition of another reversing chamber in the second stage. Depending upon the pressures and speeds used a third stage may be profitably employed.

It is, of course, understood that the size and details of the turbine may affect the choice considerably in some instances, and therefore, one may specify any one of the various combinations on knowing all the particular characteristics of the turbine. Consequently this information is given simply to show that when the pressure conditions are accurately cited, nozzles can readily be provided that

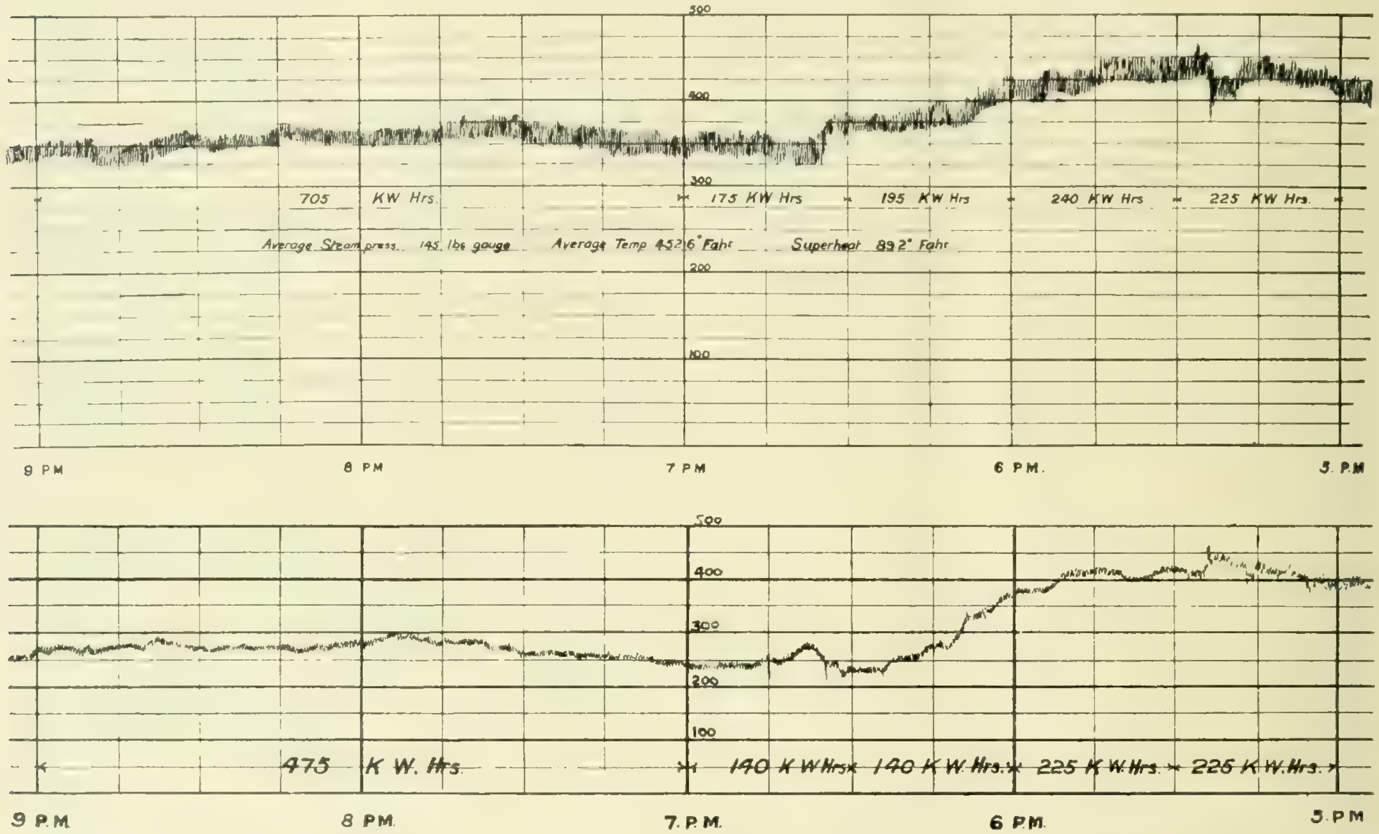
will result in very efficient turbines, and hence the exactness of the turbine construction will not be neglected, as no increased expense is entailed in ensuring its correctness.

A section through a 150 kilowatt, non-condensing turbine designed to drive an alternating-current generator is cited. The flexible system afforded by the "re-entry" type may be said to be a direct result of the precedent established by the standard Parsons turbine in its ready compliance with working conditions, for instance, as accomplished in regauging; i.e., altering the relative angular position of the blading. The simplicity of construction realized in these small turbines may be observed from the sectional details, and therefore, requires little explanation. The rotor, comprising a flat steel disc with one row of blades mounted on the periphery, is carried upon an overhung shaft. A continuous shroud for the blades is established by having projections cast on the back of each, to mesh with the face of the adjacent blade, which not only serves the primary function of maintaining the integrity of steam jet, essential in the impulse type, but also firmly braces the outer end of the blade, obviating any tendency to vibrate.

An additional bearing is provided on the governor end to steady the supplementary governor gear shaft, this being made detachable to facilitate dismantling. The cylinder is supported on benches forming an extension of the generator bed plate. This not only assures perfect alignment, but also eliminates any effect from temperature variations. Geared governors are used as they establish the highest degree of regulation. Forced lubrication is secured through the gear type pump which forms an integral part of the turbine and results in a self contained automatic unit. Oil under pressure reaches all surfaces in frictional contact. Protection against overspeeding is provided by an auto-

Mixed Type

A composite impulse and reaction turbine was first designed in this country in 1902 mainly to accommodate large capacities, which innovation resulted in the successful development of the high-power double-flow turbine. In the small impulse turbine the economy for condensing work may be materially improved by the addition of a low pressure stage containing Parsons blading. A number of turbines of this type have been built ranging in capacity from 100 to 200 kilowatts. This unit largely resembles in most of its details, the well-known Parsons type previously described, with the exception of the high pressure end. For this part an impulse wheel replaces the high pressure reaction blading, and is so designed as to efficiently absorb a large drop in steam pressure, or more correctly, heat energy. Incidentally, this same wheel is appropriated as a balancing dummy for the low pressure reaction end, which manifestly brings about unusual compactness. In this design, comparatively low blade speeds and steam velocities may be efficiently employed with the advantages of greatest freedom from the erosion resulting from the high velocity of moist steam jets, reference to which has previously been made,—the cutting action varying approximately as the square of the relative velocity. Where fuel is costly, such a design, although more expensive, should prove fully warranted. It further exemplifies the versatility which is possible in turbine designing and is a type which has come into quite general use in Europe, where the fuel item is always the foremost consideration.



Comparative Load Curves of Steam Engines (above) and Exhaust Steam Turbine (below), Regina, Sask.

Low Pressure Turbines

The low pressure turbine will undoubtedly be found to be a benefit to the small reciprocating engine plant. In many of these stations the engines have been operated non-condensing for the reason that the expense connected with a condensing equipment would scarcely be warranted in

view of the small return effected. Since the turbine works so efficiently in the low pressure ranges, station operators may safely expect to improve their plant economically from 30 to 100 per cent. through installing the low pressure turbine to work on the exhaust of their engines.

Such results are entirely practical and have been obtained, as in a typical case of a 500 kw. low pressure unit installed for the City of Regina, Canada, where exhaust steam is obtained from one 22 by 30 inch Corliss and one 11 and 20 by 14 inch compound automatic engine, governing being accomplished entirely through the latter units as the turbine is tied in electrically through synchronous alternators. The accompanying graphic charts show clearly that the fuel value has been practically doubled at the switchboard. Using the average figure given on the chart, it will be noted that the low-pressure turbine delivers 0.97 kilowatts per kilowatt of the engines. A fact developed in this station, as in many other low-pressure turbine installations is that no impairment of vacuum occurred due to the pressure in the piping between engine and turbine falling below atmosphere. On the turbine load chart the inlet pressure varied from 3 to 15 inches vacuum, an average vacuum of 28.4 inches (30 inch barometer) being maintained at the turbine exhaust. Several advantages, both from the standpoint of efficiency and mechanical operation, accrue from allowing the pressure between engine and turbine to vary with load.

In a great many cases low pressure turbines warrant the use of cooling towers where an adequate cooling water supply is lacking. Cooling systems may be arranged in various practical ways, and they generally add but a small percentage to the plant investment. They vary from being made of a pile of brush with suitable distributing troughs at the top, as pursued in some southwestern sections, or wooden lattice construction of open type, or spray nozzles either distributed over a cooling pond, or else as occasionally done, by appropriating the power house roof as a water shed, to the more expensive enclosed forced or natural-draft chimney coolers. These references are simply made to impress the fact that where small stations are unable to obtain a natural supply of condensing water, an effective substitute may thus be devised. In the design of cooling towers, free fall and excessive lift of circulating water must be avoided in order that their operation may be most efficient.

Notwithstanding the high thermal efficiency that may be secured through using the low-pressure turbine, its installation is not to be indiscriminately recommended. It simply becomes a matter of economic consideration as to whether or not, at the load factor at which the plant is operated, the saving in fuel expenditure will be sufficiently in excess of the capital charges on the increased plant investment.

Generally the construction of the low pressure turbine is similar to that of the complete expansion turbine, excepting that the high and intermediate pressure elements are omitted. For small capacities, it would again be convenient and desirable to adopt the re-entry type.

Bleeder Turbines

Frequently central stations find it profitable to supply a heating load in addition to its electric output. Previously in turbine plants, the low pressure steam was taken from the entrance of the intermediate stage and delivered to the heating system through a reducing valve. This method not only entailed considerable loss, but the amount of atmospheric pressure steam that could be bled, was unduly limited. To obviate this shortcoming of the standard condensing turbine, a special type of turbine has been developed, in which the steam that passes from the intermediate to the low pressure stage is controlled by a valve which is, in turn, governed by the pressure in the heating main. All low pressure steam not required for heating, performs work in the low pressure section, and besides, before the steam reaches the pressure of the heating system, it has been efficiently utilized in the high pressure elements of the turbine. When all of the steam is to be diverted to the heating system, the entire amount may, by special exterior piping, be made to pass through all stages of the turbine, thus obviously improving the economy.

Operation and Maintenance

Being entirely self-contained, the turbine requires minimum attention, and very frequently is given but little more care than an electric motor. In fact, a central station owner visiting another plant, thought that the turbine driven centrifugal pump was electrically propelled. The absence of internal wearing surfaces such as in the steam-engine cylinder, prevents trouble from scoring and damage following a failure of the oil supply.

As there are no reversal shocks or strains in its operation, it is least subject to any disturbance of the correct adjustments. Therefore, the frequent applications of the indicator, taking up on pin bearings, resetting of valves and knock-off blocks, do not enter the operation of the steam turbine station. Further still, the turbine is immune from any damage due to "slugs" of water coming over with the steam, while with the reciprocating engine, precautionary measures must be taken to avert serious accident from this cause, by insuring that the cylinder relief valves are always operative. The exhaust is not contaminated with oil, and may, therefore, be safely used for any industrial application.

Bearing the above factors in mind, it is to be appreciated that the station force may be applied with the highest possible efficiency in a turbine equipped plant. The introduction of novel and valuable electrical appliances and the prosecution of new business campaigns, requires the almost continuous attention of the management of small properties. With the greatest safety in operation of the power house equipment, the management may well devote less attention to this part of the system and apply the time thus saved to a greater development of the company's service.

TABLE II—TEST OF CORLISS COMPOUND ENGINE AT AMERICAN SUGAR REFINING CO.'S WORKS, BROOKLYN, N. Y.

Steam Pres. Gauge Dry Steam	Vacuum Ref. to 30 in Bar	R. P. M	Ind Hp	Mech. Eff. Percent.	Elect Eff. Percent. Not inc. field loss	Equiv. Kw	Water Rate Lbs. per Ind. Hp—Hr	Water Rate Lbs per Kw—Hr.	Lbs. per Kw—Hr.* Corrected to 100$ Superht & 28" Vac.
148	27.48	120.5	1004.0	95.0	93.9	670	12.75	19.16	17.8
149.8	27.98	120.9	853 3	94.3	93.8	562	12.33	18.7	17.6
149.9	27.64	121.2	819.6	93.9	93.8	538	12.55	19.1	17.8
151.3	28.26	121.5	627.4	92.0	93.3	403	12.10	18.9	17.86
150.1	28.33	121.9	491.4	90.0	92.8	311	13.92	22.35	21.15
150.1	28.16	122.6	339.7	85.3	91.8	200	14.58	25.0	23.3

*Correction Factors:—
Superheat—0.6 percent per 10 degrees F. change.
Vacuum—two percent per inch change of vacuum

When the subject of maintenance is considered, the question of local conditions must be given attention. Where there is a good quality of feed water, the turbine has usually been found to retain its original standard in service. But with water possessing any active chemical properties the cylinders have given evidences of erosion, and where steel blades were used, have required reblading

in some cases, and, in a very few instances, reboring and relining of the cylinder. Original bronze blading which had been in service for nearly seven years in a 400 kilowatt turbine at the Johnston Harvester works at Batavia, N.Y., did not show signs of impairment.

Several years ago a great deal of discussion was centered about the relative efficiencies of the engine and turbine. Actual tests have fully shown that the turbine excels for condensing service, bearing out the general concensus of opinion. In considering economies on the whole, engineers should avoid simply comparing two types of units merely by test results or guarantees. A factor for the decline in efficiency in service should always be introduced. Very little change in turbine economy will take place, especially where moderate steam velocities obtain, and its efficiency may be regarded as a practically constant quantity. This cannot be said of the reciprocating engine. Losses from leakages and poor adjustment of valves may, of course, be reduced to a rather small quantity. However, it is rare that they are entirely eliminated.

Economies

It is the extent of the deterioration in efficiency which may vary from one to ten per cent or more, that concerns the power engineer. Such conditions are shown in the report of Messrs. Dean & Wood, read before the American Society of Mechanical Engineers in 1908, in which the fact was prominently brought out that the performance of practically all small engines was very much inferior to their rated efficiencies.

These statements are not intended as an arraignment of the reciprocating engine which, undoubtedly has been one of the potent factors in the early development of our industries. But many of its present drawbacks are so evident that they establish reason for its rapid supercession by the turbine. It is, of course, not to be gainsaid that the reciprocating engine of the highest type using multiple cylinders, steam jackets, reheating receivers ,poppet valves in the cylinder head, and other refinements, have made noteworthy records. However, with ordinary working conditions and designs, a wide departure occurs from any such excellent operation, and this is becoming more broadly recognized, as indicated in a recent new engineering text book by Prof. W. D. Ennis, which compares the best performance attained by the different types of reciprocating engines with the average results to be expected in practice with the usual good engine operating on reasonably steady loads. Operating conditions have been omitted, but manifestly it is the relative value of the two columns in Table III which bear the greatest significance.

TABLE III.—COMPARISONS OF BEST STEAM RATE WITH AVERAGE STEAM RATE OF RECIPROCATING ENGINES USING SATURATED STEAM.

	Best Steam Rate Lbs. per Ind. Hp-Hr	Average Steam Rate Lbs. per Ind. Hp-Hr.
Simple Non-Condensing.........	21.50	38.00
Compound Non-Condensing...	19.14	23.00
Simple Condensing....... ...	16.50	22.00
Compound Condensing.........	11.22	18.00
Triple Expansion Condensing....	11.05	
Quadruple Expansion Condensing	(162.29 B.t.u. per min.; about 8.5)	

For non-condensing service, the small turbine is an extremely close competitor of the reciprocating engine, and when the inability of most engines to maintain their efficiency, is properly regarded, the turbine is fully on a parity, or may even surpass the engine. Partial data on economics is always unsatisfactory, as the working conditions of speeds, pressures, and capacities, should invariably be considered, due to the marked influence they exert upon the results obtained.

Essential as it may be where the fuel supply is costly, the heat efficiency of apparatus is plainly not the only governing factor in the selection of power house equipment. The cost to operate and maintain should also be critically regarded. Total operating cost of small stations averages as high as 2.5 cents per kw. hour or more, down to 0.6 cents or slightly less per kw. hour, including fuel, labor, oil, waste, supplies and maintenance. Evidently these figures depend upon size and type of equipment, cost of fuel, loading and other local factors, so that comparison may be misleading unless surrounding conditions in the two types of plants are very similar. While such data is usually rare, the following relationship between the turbine and high grade reciprocating engine layout obtained from the actual operation of stations of about 5,000 kw. aggregate capacity in corresponding service, represents fairly well the economic influence of the steam turbine. With the engine costs taken as unity the comparative costs in the turbine station follow:—

Fuel	93	percent (high)
Labor and Superintendence. ...	75.5	percent
Oil, Supplies, Miscellaneous ...	23	percent
Repairs and Maintenance	56	percent
Total Operation	85.7	percent

For smaller plants, these ratios should increase to some extent, but the overall results with the turbine will invariably remain superior. The foregoing percentages may fluctuate greatly, depending upon many factors, as the "personal" efficiency, age of apparatus, skill in operation (boilers in particular), etc., but invariably the turbine plant will be found the most profitable, not only from such immediate results as just cited, but also from the indirect causes previously defined. In a like manner we may treat of other forms of power machinery, but with stations of moderate size herein discussed, and coal not exceeding $3 to $3.50 per ton in cost, the best results are to be derived with the turbine equipment when both their aggregate running expense and capital account for the year are compared.

Installation

More striking than any other feature, is the exceedingly small engine room required to accommodate the turbine equipment. An extreme example has been taken such as would exist in a city office building where property and likewise the basement space possesses considerable value.

With an installation of tandem, compound reciprocating units of equal aggregate capacity (given preference over the cross-compound on account of space conditions), the floor area requirements would be approximately three times that of the turbine equipment, in spite of the fact that a 500 kw. alternator with a rotary converter was included for the purpose of supplying direct current when this might have been accomplished in a more direct way. Obviously the turbine contributes materially toward economy in the building and real estate investment. No restrictions are placed on the location of the turbines since heavy foundations to prevent vibration are not essential. Therefore, the turbines may be placed in accordance with the arrangement best suited to local conditions. They may even be carried on a structural support on a deck over the boiler room or other space, or else set up in the basement without fear of imparting vibration to the building. Due to its rotary motion, there are no pulsations in the turbine, rendering the use of foundation bolts unnecessary. The compactness of the turbine also facilitates its transportation and erection. Turbines of the sizes described, may be placed in service with unusual dispatch when received at the power station, thereby involving a minimum of time and expense for their installation.

The Illumination of Fort Garry Station

The New Union Depot in Winnipeg a Model of Convenience—Spacious and Well Lighted—Electric Power Used Throughout

The completion of the new Union Station on the historic site of old Fort Garry near the junction of the Assiniboine and Red rivers, marks another mile post in the march of progress of railway construction in Western Canada. This station located as it is on old and historic ground, is occupied jointly by the Canadian Northern and Grand Trunk Pacific Railways, both comparative youngsters in the railway world and both rapidly nearing their goal of ocean terminals on the Atlantic and the Pacific.

The station is one of which Winnipeg and the West may well be proud, for in architectural beauty, convenience for the traveling public and in the general layout of the terminal, it is excelled by few if any stations on the continent. Its location too, on the wide well-paved Main street at the foot of the Broadway Boulevard is one well calculated to give an excellent first impression to the visitors to the city. Its location within a few hundred yards of the center of the city and with an excellent car service from all directions is also one of great convenience to the travelling public.

The engineering problem was one difficult of solution for the space allowed for freight and passenger tracks and for sheds, etc., was comparatively limited, but they have been so well laid out that there are few terminals in the country with so limited room, that have as good teaming and freight handling facilities.The terminal yards occupy nearly all of the space in the area bounded on the south by the Assiniboine river, on the east by the Red river, on the north by Water street, and by Main street on the west. The odd shape of this area and the nearness of the two rivers has necessitated the use of the through type of terminal in preference to the stub end type. The layout provides for eight through passenger tracks with adjacent platforms under the train shed, and for two open tracks for through freights. The lines come in from the east over a new double track steel truss bridge nine hundred feet long containing a jack-knife lift span, the only lift bridge of its kind in Canada. A double track lift bridge crosses the Assiniboine river at the west end of the station. At each end of the passenger tracks will be a signal tower controlling all switches by the electro-pneumatic system. The freight tracks come over from the St. Boniface yards of the Grand Trunk Pacific across a two-track bridge now in use, and go out to the Canadian Northern yards in Fort Rouge over a four-track bridge across the Assiniboine river. Signal towers are also provided at these bridges.

As before noted the local freight yards are very compact and well laid out. The team yard comprises 42 tracks each about 800 feet long with a capacity of twenty cars. To facilitate switching, the leads of these tracks are dividea by crossovers into three groups of fourteen tracks each, so that three switch engines can work at a time. The driveways are thirty feet wide and are of particularly substantial stone block construction. They are tapped by a seventy foot avenue running the length of the yard. This driveway is provided with ample outlets onto the city streets, so that no congestion of traffic need occur.

The nearness of these yards to the center of the city's business district should mean a substantial lowering of the usual high cost of cartage. Large well designed freight sheds are provided for handling the outbound and incoming freight of the two roads.

The train shed is of the most modern type. The smoke and steam from the locomotives is discharged into the open air through slots in the roof. These slots are about two feet wide and their sides come down below the top of the smokestack so that none of the smoke is discharged into the train shed. The platforms are sufficiently long to take two eleven car trains, and their total capacity of 200 seventy-foot passenger coaches. Evern modern convenience that would facilitate the handling of passengers, express and baggage has been provided, and the comfort of the traveler has been looked after to a marked degree. The passenger goes down stairs from the station platform to a subway running under all the tracks, and which opens into the ticket lobby of the station. The emigrants are taken through a separate entrance to their waiting room which will be described later. Baggage and express are carried from the station platform to the trucking subway beneath

Fort Garry Station—Corridor of Waiting Room.

the tracks. Electric elevators are used for this work. The baggage and express rooms will finally be located under the west end of the train shed, and will be readily reached from the street by the baggage and express wagons.

The ticket lobby, a clear circular space of ninety feet diameter, and with a high decorated dome occupies the central position in the building. The ticket booths are located in the south side of the lobby, and the clear unobstructed space under the dome will facilitate the handling of that laige part of the traffic which does not use the waiting room, and will insure a much larger degree of rest and comfort in the waiting room, than is usual in railroad stations. In the rear of the ticket booths is the baggage checking room. This will ultimately be used as a waiting room when the traffic demands it, and the baggage can be checked from a counter in the room. A pneumatic tube system will connect the baggage counter with the baggage room.

The lobby is lighted in the day time by four large arched windows, and a skylight in the dome, and at night by the ornamental standards shown in the accompanying cut of this room. The lights in these standards are all tungstens, sixty and one hundred watt. A railroad balcony extends around the lobby at second floor level, and the

post standards are placed on it, while the bracket lights go on the wall beneath it. In addition to the standards and wall brackets, about 20,000 watts is used in 40-watt tungsten lamps in indirect lighting of the dome and lobby. One circle of reflectors is placed on a concealed ledge under the dome and throws the light upwards. Another circle placed above the skylight at the top of the dome throws the light downward through the skylight. 40-watt lights are also placed in straight horizontal reflectors beneath the four large windows in the lobby and concealed on

Fort Garry Station -Waiting Room.

the ledges between these windows. The reflectors used are of the Frink type, and the distribution of the light so uniform that at night it is nearly impossible to locate its source. These circuits are controlled from the main floor by push buttons operating solenoids on the top floor, and so arranged that half or all of the lights may be thrown on. The general effect of the illumination of the lobby is very good, and the fixtures present an excellent appearance in the daytime.

The waiting room is in the north wing of the building, and as before noted opens directly on the ticket lobby. The accompanying cuts show clearly the arrangement of the waiting room and the adjacent corridors, and the type of lighting fixture used in these places. The wall panels surrounding the room are decorated with the coats of arms of the various provinces. A marble wainscoting six feet high is carried all around the ground floor, and the walls above are finished in a stone effect. A skylight forty feet by one hundred feet furnishes excellent light for the waiting room and the baggage rooms in the day time, and the soft light from the tungsten light fixtures with opal globes rivals this at night.

Adjoining the waiting room and opening into it are the lunch room and the restaurant. These also open on to Main street and to a carriage drive at the north. Rest rooms for the men and for women open off the east corridor of the waiting room.

Emigrants are splendidly provided for in quarters occupying the whole of the south wing of the basement. There is a waiting room of ten thousand square feet area, a laundry, and ample toilet and bath facilities for men and for women, and many other conveniences not usually found in railway stations. These rooms are well lighted by one and two light tungsten fixtures with Alba shades and 150 watt Mazda lamps.

The second and third floors are fitted out with offices for the use of the two railways and the National Transcontinental Railway. A total office space of 25,000 square feet is now available, and most of it is in use, and to provide for further growth, the building has been designed to allow for the addition of six office floors giving a total floor space of 200,000 square feet. The building has been so designed that there is no necessity for artificial lighting in any part at any time during the day. Tungsten lamps with standard fixtures are provided in the offices, and in the corridors, except that the latter are provided with hemispherical diffusing globes. Four electric elevators serve the office floors and the basement. The north wing of the basement is devoted to the heating and ventilating equipment, stores, etc., for restaurant and dining car service.

Owing to the high class of central station service provided in Winnipeg, no isolated power plant is installed, but provision has been made for the installation at some future time of generating apparatus, and necessary switchboards.

The generating equipment as planned comprises one 200 kw. 550 volt, 3 phase, 60 cycle generator for power and lighting service, and a 100 kw. 500 volt direct current generator for elevator and motors on sewage disposal system. There are installed at present six 125 h.p. boilers operating at 100 lbs. pressure. These are equipped with Jones underfeed stokers. A reducing value reduces the steam pressure to 3 or 4 lbs, at which pressure it is used for both direct and indirect heating. There are installed at present three 50 kw. 2300/220/110 volt transformers from which is supplied the lighting feeders on a three wire 110 volt single phase system. Three 25 kw. 2300/550 volt transformers supply power for operating the motors in the building. A 500 volt direct current circuit supplies power for the four passenger elevators, and six freight elevators for the train shed. A six panel Crouse-Hinds switchboard distributes the power received from the above sources.

As the basement of the building is below the sewer level, two sets of sewage receptacles are installed and the

Fort Garry Station—Ticket Lobby.

sewage is lifted by compressed air, supplied by two compressors driven by direct current motors which start and stop automatically being controlled by a pressure gauge with solenoid switches. The building is drained into a sump which is automatically emptied by a motor driven centrifugal pump controlled by a float switch.

For the indirect system of heating used on the ground floor, air is taken from the station platform and drawn through cloth screens and the steam pipes and forced by a large fan, driven by a 7½ h.p. 3 phase motor, variable

speed into the large air ducts. Two similar fans driven by 5 and 10 horse power motors are used for ventilating purposes. A four horse power motor, two speed, is direct connected to a centrifugal blower used for cleaning the dirt from the air screens above mentioned in connection with the heating apparatus. There will also be installed a 50 horse power three phase motor for driving an air compressor for supplying air to the train platform.

In addition to the above motor applications, there will be installed a large number of small motors for use in the restaurant and similar service.

A watchman's clock system with twelve stations, a time clock circuit with a Howard master clock, and an extension buzzer system are among the details looked after by the general contractors.

The lighting of the train shed and viaduct and rooms beneath is all done with Nernst lamps, one to five glower units, in all about 300 lights. Eight ornamental standards are placed on the sidewalk in front of the building. These add materially to the illumination of the street and present a very attractive appearance in the day time.

The railway officials who have co-operated for the construction of this splendid terminal are Sir William Mackenzie, president of the Canadian Northern; Sir Donald Mann, vice-president, and Mr. M. H. McLeod, general manager and chief engineer, and for the Grand Trunk Pacific, Mr. Chas. M. Hays, president; Mr. F. W. Morse, vice-president, and Mr. B. B. Kelliher, chief engineer. Warren & Wetmore of New York have had charge of the design of both station and yards, and have supervised the construction with Mr. J. D. Matheson in direct charge of the work. To the latter the writer is greatly indebted for the information and pictures contained in this article. Lyall & Mitchell are the general contractors for the work.

Montreal Elevator and Conveyor Systems

Built and Installed by the Harbor Commissioners—15,000,000 Bushels in 1910 — Electrically Operated Throughout

The history of the development of the western grain lands is, in a large measure, the history of Montreal's facilities for the storage and shipment of the grain. The C.P.R. was the first to erect an elevator there, but this was found insufficient to accommodate the increasing quantities brought down by lake boats. Later, floating elevators were constructed in order to facilitate the quick passage of these boats, but the volume of business increased so fast that it was found imperative to erect steel elevators, not only to store grain, but to enable its speedy discharge into the vessels which conveyed it to British and other ports.

The Montreal Harbor Commissioners have been alive to the importance of this department of Canadian trade. and erected the first steel elevator in the port. It has a capacity of a million bushels, but the pressure upon it is so great that a second elevator of reinforced concrete, with a capacity of 2,600,000 bushels, is now being constructed. In 1910 the number of bushels elevated was 14,906,569, as compared with 565,355 in 1904, and great as was the total last year, a large amount of business had to be refused owing to want of room.

When the new elevator and other terminal facilities are finished, Canada will, according to Major G. W. Stephens, president of the Commissioners, control the grain export business of North America and trade that now goes to Buffalo will be diverted to the Dominion. This, because the Canadian water route to Montreal is shorter, better and quicker.

The elevator and conveyor systems of the Harbor Commissioners are operated by electricity, the current being supplied, under contract, by the Montreal Light, Heat and Power Company. When the grain is brought down by the lake boats it is conveyed into the elevator by means of marine legs, which are lowered into the vessels' holds. These legs are connected with a steel tower, which runs on a track, and so permits the legs to be lowered wherever required along the elevator wharf side. The grain is worked into the legs by huge shovels controlled by compressed air and electro-magnetic clutches. The latter are so arranged as to work in pairs alternately reversing the drums working the shovels. This action is accomplished by the use of automatic time interlocking solenoids, which not only prevent the reversing motion from being applied too quickly, but lock it in that position until released by the switch, thus allowing only one drum in each pair to run in the same direction. These portable oil switches, which apply the current to the solenoids and thence to the magnet, are carried by flexible conductors to the hatch of the unloading vessel. Power for these magnets is supplied by a motor generator set located in the sub-station.

The grain is carried to the top of the marine tower, weighed, and finally deposited in the many bins, which are

Low Tension Switchroom—Montreal Elevator System.

of three sizes, having a respective capacity of 20,000, 7,500 and 3,000 bushels each. Before it goes into the bins the grain is weighed a second time by means of special machinery.

The electrical plant to operate the receiving end of the elevator consists of four motors of 150 h.p. each, driving the lofter legs; two marine leg motors, one of 100 h.p. and the other of 75 h.p.; a conveyor motor of 50 h.p.; shovel motor of 50 h.p.; car puller motor of 50 h.p.; two cleaner motors of 15 h.p. each; pump motor 10 h.p., and a passenger hoist motor of 15 h.p.—a total of 1,000 h.p. All operations are controlled from the switchboard room by a series of double throw starting switches connected to a low tension

switchboard. Specially arranged signals facilitate the starting and stopping of these machines. The transformers are 375 kw. capacity, and were supplied by the Canadian General Electric Company; they receive power at 2,200 volts and step it down to 575 volts.

The commissioners' conveyor system is the largest in the world. By it the grain is conveyed from the bins through a series of galleries, mainly supported by steel

High Tension Switchboard and Transformers.

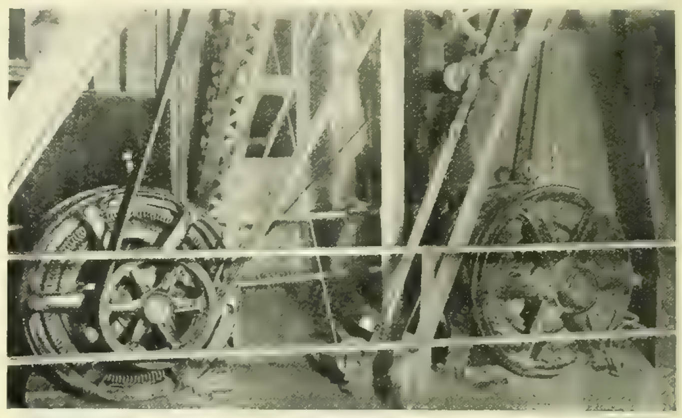
towers, to vessels in any required part of the sheds along the whole water front. These galleries lead from the elevator proper right along the sheds, and are designed to deliver grain directly to the ships at their berths; they have proved of great advantage in connection with convenient and economical shipments. When grain is required the amount is weighed up and conveyed over rubber belts through the galleries to the particular ship, into the hold of which it is sent through spouts. There is an electrical signalling system advising the feed tenders of the amount desired to be shipped. The motors for driving the belts in the galleries are placed in the towers, and are twelve of 60 h.p. each, four of 50 h.p. each, two of 85 h.p. each, five of 75 h.p. each, eight of 40 h.p. each, a total of 1,785 h.p. These are of various makes, but many are of the Westinghouse type, all being controlled from extended circuits from the main bus bars in the station. The transformers feeding the galleries are three in number, supplied by the Allis-Chalmers-Bullock, Limited.

There are two low tension switchboards and one high tension switchboard in the sub-station. One of the low tension switchboards is equipped with low volt bus-bars and normal volted bus-bars, the starting operation consisting of throwing the switch on the low voltage bus when first starting up, and on to the normal voltage bus when coming up to speed, thus doing away with a compensator for each individual machine. The low voltage bus is brought directly from taps on the transformers.

The second low tension switchboard is equipped with oil type circuit breakers supplying current to the compensators in the towers. At each tower there is a distributing panel with fuse circuits for each motor in that tower. The tower motors, owing to their great distance from the source of supply, have each a compensator for starting duty; that is, the same operation is performed for starting, excepting only that normal leads are carried to the individual towers. There are indicating ammetres and voltmetres of a suitable range on each of the switchboards, which give the operator complete information as to the output. The high tension switchboard controls the current from entrance to the banks of transformers, both power and lighting, and is equipped throughout with the automatic type of oil circuit breaker closing the transformer circuits. There are recording and integrating types of watt meters with switchboard for control of the local amount of energy used on the system. On the high tension wires suitable lightning arresters and choke coils are installed for the protection of the transformers.

The lighting is by incandescent lamps, which are preferred to the arc type owing to the danger of igniting dust from the grain by the latter. The elevator lights are from 110 volt mains and the gallery lights from 440 volt mains, four lamps in a series. 440 volt mains lead from the sub-station to distributing panels, with fuse switches for each circuit in the galleries and towers.

There is a complete telephone system, requiring a motor generator to supply energy for its satisfactory operation. The telephone is of the intercommunicating type, reaching to all the towers with jacks at the windows. In connection with the energy used for the system a storage battery of suitable size to ring twenty-four four-inch bells in multiple at one time or two twelve-inch gongs at one time, is installed. Signal and emergency systems have also been installed. The former is equipped with red lamps and num-



Motors Operating in Tower A.

bers, by the operation of which grain is sent to any part of the galleries desired. The emergency signals are for use in case of grain choking the spouts or the machinery breaking down. These systems are connected with the sub-station, enabling the engineer to keep in touch with all departments of the plant.

Mr. T. E. Salter is the chief electrician in charge of the plant for the Harbor Commissioners.

The Hyslop Automatic Electric Starter

The Hyslop Automobile Company are installing on a number of their latest type machines a very ingenious electrically operated device which does away with the old method of cranking the engine at starting. The engine is provided with a small electric generator, which on occasion acts as a motor operated by a battery of storage cells. For starting the engine the clutch is released, the cells are automatically thrown on to the motor which revolves, and being connected through a gear and clutch with the revolving shaft of the engine, performs the same function as cranking by hand. When the engine is in operation the generator output charges the cells, lights the car and provides the necessary energy for the spark discharge, thus doing away with the magneto.

The Electrical Side of the C. N. E.

Exhibits yearly increasing in number and proportions but more than all in active interest on the part of the general public.

The electrical display at the Canadian National each year becomes an increasingly important department. It is really unfortunate that more suitable quarters are not provided, either in the form of a separate building for electrical displays only, or, as one exhibitor expressed himself, have the location so planned that each electrical exhibit may be seen in closest proximity to its proper field of operations, as for example, motors might well be exhibited operating machinery in the Process building. A simple display of motors or dynamos or unlighted lamps or silent telephones is surely less valuable than an operating display. The present broadcast distribution of electrical apparatus over the whole Exhibition grounds simply means that unless the electrically inclined visitor spends two or three days investigating every nook and cranny of the whole exhibit he does not see all the apparatus that interests him or that the exhibitors are trying to interest him in.

We give below a short itemized report of the various electrical exhibits shown:—

Death & Watson, manufacturers of electric signs, had an exhibit in the transportation building, including electric lighting equipment for automobiles.

John Millen & Sons had an interesting exhibit, principal of which was the well-known Coventry noiseless chain, the system now being widely used in place of belts or ropes.

The Fairclough Art Glass & Decorating Company had a compact little corner of attractive art glass samples and electric fixtures. Shower effects were especially prominent.

The Jos. P. Cleal Co., in addition to their large 6-ton scale exhibited a line of electric fans, toasters, heating pads, etc.

The Gibson Electric Company, agents for the Hupp-Yates and Babcock electric automobiles, was a point of great attraction among the automobiles in the Transportation building.

Jones & Glassco made a specialty of their widely known Reynold silent chain, which was shown in operation. The exhibit of this firm also included a patent clothes drying machine.

The Canadian Carbon Company, in the Transportation building, had a fine display of X cells, the kind with the nine lives; also a varied line of flashlights, miniature lamps and electrical novelties.

The Dominion Telephone Co., of Waterford, Ont., showed an attractive exhibit of telephones of various kinds, switchboards, and all the various equipment necessary for the installation of a modern telephone system.

The Campbell Gas Engine Company, of Halifax, England, through their agents, Chambers & Simpson, 103 Bay street, Toronto, had an exhibit of gas engines, oil engines, suction gas plants, etc. Also a display of D. and J. Tullis, Scotland, washing machines.

The Waverley Electric Company had a varied display of cars and trucks fitted with storage batteries. These attracted a great deal of attention, indicating that the electric vehicle is destined to take a very prominent place in the automobile world in the near future

The Canadian H. W. Johns Manville Company showed a varied line of overhead construction material, no-arc fuse material, electric tape, J. M. and red seal batteries, J. M fibre conduit for underground work, and solderall, a solder that does not require the heat of a torch to fuse it.

The British Aluminium Co. exhibited through their Toronto agents, Messrs. Parke & Leith, a very comprehensive assortment of aluminium apparatus and requirements, including all the electrical uses to which this metal is now generally put, all the household uses, and all its general purpose uses.

The Automatic Electric Cook Company had a number of their new automatically controlled electric cook stoves in operation. Mr. Templeton expressed himself as very pleased with the reception this new invention was accorded by visitors at the Fair. It was claimed for the cooker that it is cheaper to operate than a gas stove.

The Canadian Tungsten Lamp Co. This company's exhibit was shown by the Dominion Illuminating Rental Co., of 123 Bay street, Toronto. In addition to the well-known Kolloid Wolfram lamps manufactured by the Canadian Tungsten Company, there was a full display of electric fixtures, shades and glassware of all descriptions.

The Fisher Electric & Mfg. Company showed a variety of vacuum cleaners, floor polishers, coffee mills, meat choppers, valuable speed drills and lathes, all electrically operated. A valuable feature of their vacuum cleaner is the ease with which it can be moved about the room, being mounted on a little truck.

McDonald & Willson—The noticeable feature in connection with McDonald & Willson's exhibit were the shower crystals, and the alabaster bowl style of semi-indirect lighting for both of which this progressive firm report an increasing demand. Not many pendants were shown, the present demand being for the shorter ceiling fixtures.

The Radiant Electric Company exhibited the regular line of electric irons, toasters, percolators, electric radiators, and so on. Special features of their exhibit were drink mixers operated by a miniature motor which they are handling for the Hamilton Beach Company, of Racine, Wisconsin, the Eureka vacuum cleaner, for which they also are agents, and a breakfast set including four pieces in one.

The Crown Electric Mfg. Co. showed a wide variety of electric fixtures. Shower effects were very prominent, the well proportioned plainer designs indicating that the elaborate fixture is less popular than formerly. Special attention was attracted by some handsome electroliers of Greek design, and a well proportioned newel post fixture. The illuminated pedestal was a novel and very decorative feature.

The Nineteen Hundred Washer Co. demonstrated an electrically driven washing machine and wringer operated by the same motor, a Westinghouse 1/12 h.p. type attachable to any lighting socket. These washers are being sent out on trial for one month and are giving splendid satisfaction on account of their compactness and ease of operation.

The Economic Electric Heating Company were demonstrating Royce & Company's economic heating appliances, including irons, disc stoves, etc. The exhibit also included percolators, egg boilers and a complete list of modern household requirements. Special mention may be made of the Arnold vibrator, the Royce economic iron, and the

Crown vacuum cleaner. The exhibit was in charge of the engineering firm of Holmes & Irving.

Jones & Moore showed a variety of a.c. and d.c. motors and generators, varying in size from ¼ h.p. to 133 h.p., d.c., and from 1 h.p. to 75 h.p., a.c. They also had on exhibit their popular Pelouse iron in various sizes. The motors of this company were widely distributed throughout the Exhibition grounds, being used exclusively in Machinery hall, Process building, Transportation building, and under the Grand Stand.

The Benjamin Electric & Mfg. Co. exhibited their reflector sockets for factory and other lighting, 1,500 of which were in use on the grounds. Other lines included Cutler Hammer porcelain switches, wireless clusters in combinations of 1 to 7, series or multiple, the Wirt insulating joint and a new friction drive screw driver with an insulated handle. The latter proved very popular with electrical workers.

The Canadian National Carbon Co. was represented by Mr. J. E. Hauser of the publicity department and Mr. H. Hahn of the sales department. Various styles and sizes of carbon brushes, flame arc carbons and other carbon products were exhibited including Columbia dry cells and Columbia ignition cells; also Columbia multiple batteries suitable for ignition and for automobile or motor boat lighting purposes. Factory is at 99 Paton Road, Toronto.

The National Electric Heating Company had an attractive display of irons, toasters, hot plates, percolators, a large coffee urn suitable for hotel use, etc. The double toaster of this company came in for much favorable comment. A feature of the National exhibit was the electric iron with the current on it during the entire exhibition, and after the exhibit the heating element was found to be in perfect condition. Mr. Pritzker was in charge of the exhibit.

The Toronto Electric Light Company, with which was included the exhibit of the Pacific Electric Heater Company, showed an exceptionally large variety of all the modern electrically operated household conveniences. The booth was beautifully decorated, the ceiling alone being studded with something over 500 lamps. The exhibit included the Santo vacuum cleaner, washing machine electrically operated, electric fans, and all the usual kitchen requirements, such as toasters, percolators, irons, etc.

The Northern Aluminum Company, in addition to their usual wire, cable and bar equipment, showed a very complete line of kitchen and household ware, including a combined tea-kettle and double boiler, triplet saucepan, handy kettle steamer, double fry or omelet pan, an egg poacher combination comprising eleven different cooking articles, etc. All of this ware is manufactured from the company's standard "Wear-ever" aluminum. The exhibit illustrated to the Exhibition visitor very clerly that the number of modern uses to which aluminum can be put is legion.

The Northern Electric and Manufacturing Co., had a varied display indicating the different uses to which telephones may be put. The features included fire alarm telephone systems, a complete fire alarm system being connected up. An important factor of this system was the automatic connection of the fire alarm boxes with the different floors in factories, schools, etc., enabling much more prompt alarm, in case of fire. Another new feature was the sectional type switch board, each section being placed on top of the other, similar to a sectional bookcase. There were also several types of metal wall and desk inter-phones for business men, factories, etc.

R. E. T. Pringle Company was represented by Mr. A. R. Oborne who also represented the Canadian Moloney Electric Company, The Adams Bagnall Electric Company, Cleveland, Van Dorn & Dutton of Cleveland, and Harvey Hubbell Inc., of Bridgeport, Conn. The Van Dorn & Dutton Electric Portable Tools attracted a great deal of attention. The Moloney Transformer showed was a 5 kw. 2200-volt transformer, also 15 kw. 2200, 110, 220, of the new Form A. high efficiency type. This company also showed several cores and core windings, and also primary and secondary windings. Quite a number of sales were made during the Exhibition.

The Canadian Independent Telephone Company, Limited, whose factory is on Duncan street, Toronto, had a most complete exhibit in their attractively arranged booth in the Process building. The exhibit included the very latest product of their factory in the way of magneto telephones for rural party lines and demonstrated that this manufacturing concern must have capable men studying how to improve telephone equipment for the rural service. Not only the magneto telephones but the switchboards, test sets and other equipment in the exhibit indicated that nothing but the very best material and the highest class of workmanship enter into the construction of the product of the Canadian Independent Telephone Company's factory.

The Stromberg-Carlson Telephone Manufacturing Company showed a representative line of the company's products, including their well known No. 896 type series and bridging telephones for rural service, also a standard 150-line generator call switchboard of unit type construction equipped with self-restoring drops. The very complete display of Inter-Comm-Phone equipment for residence, factory and office service attracted a great deal of attention. Among the types shown were the 6, 12, 22 and 32-station capacity instruments. A feature of this display was one of the company's A-5550 common battery lamp signal private branch exchange switchboards in operation, similar to one recently sold to the Oliver Chilled Plow Works at Hamilton, Ontario. Many people took advantage of this working exhibit to obtain a clear understanding of the operation of a telephone switchboard.

The H. W. Petrie, Limited, exhibited four Keighley gas engines and two Keighley gas producer plants. The two gas producer plants were erected outside of the Machinery Hall. One of these was used for making fuel gas, while the other supplied gas to a 65-horse-power Keighley gas engine which was erected in the north-east corner of the Machinery Hall, and which was connected by belt to an electric generator supplying energy for the large electric sign consisting of some 200 16-candle power lights, as well as power for some of the other exhibitors. Two of the other gas engines shown by this company were operating on city gas, and one on gasoline. They also exhibited a very fine vertical, double acting air compressor, made by Lacey-Hulbert & Co., Ltd., Pneumatic Engineers, of London, England. This compressor was driven by a 12 horse power Keighley gas engine, and the air so compressed was utilized in a nearby booth for pumping water, as well as for various other purposes.

The Illuminating Engineering Society is holding its fifth Annual Convention at the Congress Hotel, Chicago, from September 25 to 28.

The Street Railway has asked the city council to sanction a new belt line running from Atwater avenue to Forsyth street. The council, however, has decided to leave the matter over until the general question of a new contract with the company is taken up.

Active Extension Operations on B.C.E. Ry.

Saanich Extension of 22 miles—May Export to Blaine, Washington—New Interurban Station—Another Steam Turbine Unit.

The management of the British Columbia Electric Railway Company, Limited, have just awarded to C. C. Moore & Company, of Seattle, the contract for the extension of their auxiliary steam power plant, operated in connection with the Vancouver sub-station of the company at Main and Barnard streets. The firm is the same concern which a few years ago installed the original steam power plant for the company at this point, then making record time in the installation. The approximate expenditure represented by the contract is $250,000, and the terms call for the completion of the work in readiness for operation by December 18.

The equipment covered includes four Babcock & Wilcox boilers, each of 500 horse power, which will operate a 2,000 kw. Allis-Chalmers-Bullock turbo generator. The contract also covers condensers, piping, etc., necessary for the operation of the new unit. A special feature of the work is the erection of a reinforced concrete stack 256 feet in height, similar in detail to the stack of the same height which was constructed for the company's steam auxiliary plant a few years ago. The additional equipment will increase the available power from the steam auxiliary plant to 12,000 horse power.

The B. C. E. R. Company has also called for tenders for a large car barn at New Westminster, the location being at Queen's Avenue and 12th Street, nearly opposite the company's shops in the city. The plans called for alternate bids on reinforced concrete or wood frame with galvanized iron covering. When the tenders were opened on September 5 a choice was to be made as to the form of construction. The barn is to be 240 by 104 feet in size and will consist of two units each having four tracks.

Provision is made for pit tracks, workshops, etc., in connection with the project, the plans covering the demands for an up-to-date car barn in every particular. The work will be rushed to completion as soon as the contract is awarded.

The traffic department of the B. C. E. R. Company has announced a general reduction of its passenger rates over the interurban lines connecting Vancouver and New Westminster, the new tariff being effective on September 1, except as to the Burnaby interurban line. This latter line is operated under a Dominion railway charter and the revised rate will go into effect as soon as the formal permission of the Railway Commission can be obtained. The new rate from Vancouver to New Westminster is 25 cents single fare and 50 cents round trip. Proportionate reductions are made covering all points on the lines where interurban rates prevail. The company has also recently put in force a reduced freight tariff covering its South Fraser Valley extension which covers the 76-mile stretch between Vancouver and Chilliwack and connects the rich agricultural district lying on the south side of the Fraser river with the British Columbia coast cities.

Management of the British Columbia Electric Railway Company has awarded the contract for grading 18 miles of its new interurban line on Vancouver Island running north from Victoria, the capital of British Columbia, through the Saanich peninsula. The work will be done by Moore & Pethrick who have been doing work for the company in connection with the Jordan River power plant as well as on the E. & N. branch of the C. P. R. across Vancouver Island to Alberni. The contractors will start work at once and the terms of the agreement call for the completion of the work within 12 months.

The Saanich extension of the B.C.E.R. Co. lines on Vancouver Island will be 22 miles in length connecting Victoria with Deep Bay on the west shore of the Saanich Peninsula near its northern point. The estimated cost of the line complete is from $600,000 to $700,000. It will open up a large area of land which is ripe for settlement and development but which has previously been sparsely settled owing to inadequate transportation facilities. Considerable preliminary clearing work has already been done on the right of way by the company. From the northern terminus of the line it is probable a ferry will be operated connecting fertile islands on the Gulf with the mainland.

The management of the B.C.E.R. Co. is now negotiating, at the urgent request of the Board of Trade of Blaine, Washington, for the closing of an agreement for ten years with the council of the U. S. city covering a supply of current for light and power. The work includes the erection of a transmission line from Cloverdale, on the Fraser Valley branch of the company's lines to the international boundary line. At the boundary line the company purposes to erect a substation from which the power will be taken by the Blaine authorities and distributed throughout the city. Permission has already been given by the Surrey municipal council for the company to erect this transmission line on the Pacific highway. The lighting plant at Blaine has previously been operated as a municipal utility, the results not being satisfactory. The B.C. E.R. Co. offer stipulates a rate of 2 cents per kw. hour at 2300 volts delivered at the substation the city guaranteeing a minimum of from $250 to $300 per month. Should the plan be carried out it will be the second instance of the B.C.E.R. Co. exporting power over the international boundary line as recently a ten-year agreement along the same lines as proposed for Blaine was made with Sumas, a Washington city which adjoins Huntingdon, on the Fraser Valley branch of the company's lines.

The new interurban station and office building of the B.C.E.R. Co. at New Westminster were opened last week. The building is two storeys in height, of brick construction, the lower floor being used for passenger and freight traffic and the upper floor for the company's offices. From the station are operated the Westminster city lines, interurban lines connecting New Westminster with Vancouver over the three routes of the company between the cities and the Fraser Valley branch running through the South Fraser Valley to Chilliwack.

Mr. C. P. Lindsley, president of the Lindsley Brothers Company, manufacturers of western cedar poles and cross arms, Spokane, Washington, is making an extended inspection trip to the company's pole yards which are located in Northern Idaho, Northeastern Washington and British Columbia. The British Columbia headquarters are at Nakusp on Arrow Lake.

Electrical Activity Around Montreal

Telephone Investigation in Progress—A New Water Power Plant at Carillon Falls—Canadian Light and Power Plant Formally Opened

In the presence of a large gathering, Mrs. E. A. Robert, wife of the vice-president and managing director of the Canadian Light & Power Company, formally started the plant of the company at St. Timothee, Que., detailed description of which was given in the Electrical News of last month. Mrs. Robert pressed an electric button, which turned the water from Lake St. Louis into the turbines, setting the plant in motion. After the ceremony, luncheon was served in the power house, after which the president, Mr. F. Howard Wilson, presented a silver salver to Mrs. Robert in commemoration of the opening. In his short after-luncheon address Mr. Robert sketched the growth of the company and declared that the day marked a new era in the industrial history of Montreal. The drop in price of power which had taken place in Montreal was, he claimed, due to the formation of the company, and he prophesied that the day would come when further reductions would have to be made, and when the manufacturer would receive his power at a yet more reasonable rate. The company would soon have four units with a total of 30,000 horse power. He believed the entire street railway problem would be settled within a month. Speeches were also delivered by Messrs. G. Foster, K.C., Papineau, Robb. Senator J. P. B. Casgrain, J. W. McConnell, Ald. Carter, J. Brown, M.L.A., J. L. Perron, M.L.A., W. G. M. Shepherd and Mr. J. D. Evans, chief engineer.

Montreal and its Telephone Charges

Mr. Francis Daggar, of Toronto, is at work in Montreal preparing evidence for the city to lay before the Railway Commission in support of its application that the Bell Telephone Company supply a service to the city at the same rate as supplied to Toronto subscribers.

Briefly put, the contention of the city is that Montreal should not be called upon to pay the $5.00 extra charge for the improved instrument, making the total charge $55. Toronto gets the same service for $50, being $45 plus $5 for the improved instrument. Why, it is asked, should there be any discrimination in favor of Toronto? It is further said, on behalf of the city, that the service could be improved.

The Bell Telephone Company has met the city very frankly in regard to an application for particulars as to its property and business. The city asked for a statement setting forth—1, the capital expenditure or cost; 2, the cost of operation and maintenance; 3, the revenues for local business; 4, rates charged by the company within the limits of the city of Montreal and adjoining municipalities for exchange service; 5, statement of the operation of the company in the city of Toronto; 6, plan and profile regarding the lines of the company managed and operated within the limits of Montreal.

The company states that by reason of the impossibility of making correct estimate of the cost it has never attempted a division between its local and long distance plants in regard to the cost of operation or maintenance. In order, however, that the Board of Railway Commissioners may be in a position to judge whether the rates in force are adequate or excessive, the company has had [illegible] prepared of its plant and a valuation made by competent engineers.

"Meantime," concludes the letter to the city, "we will [illegible] furnished with a statement of the revenues from local exchange service within the exchange limits, and copies of the company's tariff, as filed with the Board of Railway Commissioners, for Montreal and Toronto exchanges. We will also see that you are furnished with such plans as the company has of its lines, both overhead and underground, in the city of Montreal. We are ready and willing at any time to furnish the city with any information pertinent to the matter of rates in Montreal"

Parlor Cars Nearing Perfection

The Canadian Pacific Railway has just put in service on the short line between Montreal and Ottawa a new type of observation car. It has been christened "The Observation-Library-Electric-Lighted-Cooled-Parlor Car," and the service has been given the following monogram for short: O.L.E.L.C.P.C.S. The car is of the usual dimensions, but the interior arrangement is quite different from those previously turned out. There are two main compartments. The front of the car is the sitting room and will accommodate twenty-four people. The observation end has been

Interior New C.P.R. Parlor Car.

specially fitted up for smokers and will accommodate twelve persons. Between these two sections are the buffet, lavatory, wash basins, and cupboard. The car has very large platforms. The interior is finished in mahogany and the ceiling in dull gold. The Stone system of electric lighting has been installed, the lights being of opal glass. The storage battery is charged by a dynamo under the car. There is plenty of ventilation, cool air being provided by a very ingenious system of fans. There is an excellent library in the car. It would seem that nothing has been forgotten that could be conducive to the comfort and enjoyment of the traveller. A photograph of the interior of this coach is shown herewith.

The National Hydro-Electric Company

Mr. Walter J. Francis, consulting engineer of Montreal has just presented his report to the National Hydro-Electric Company, Limited, Montreal, on the possibilities of power development at Carillon Falls on the Ottawa River 35 miles above Montreal. According to this voluminous

report, this power site is capable, on full development, of producing as much as 160,000 h.p. on turbine shaft. Already, says the president, Mr. Henry Miles, before any development work has been done requests have been received for several thousand horse power which would be taken as soon as could be furnished. The company's plans have been approved by the federal government authorities; the lease of the power privileges has been signed and published and all that remains to be done is to finance the project. Four or five million dollars will be required for development work and the securing of this will be proceeded with almost immediately. It is likely that European capitalists will be invited to furnish the funds for this gigantic undertaking. This is said to be the last important water power possibility remaining to be developed within the economic radius of Montreal. It is the intention to keep it as an independent concern and the promoters anticipate that they will be able to dispose of their power in large blocks; in other words, to wholesale electricity to large corporations, municipal and manufacturing both for lighting and power purposes. It is not their intention to supply private individuals nor to operate lighting plants, as many other companies do. The secretary of the company is Mr. Louis Gosselin and the present offices are in the Leeming-Miles building, St. Lawrence Boulevard, Montreal.

Montreal & Southern Counties Railway Extending

Mr. Justice Laurendeau has refused an application by the Town of St. Lambert for an injunction restraining the Montreal and Southern Counties Railway Company from extending its electric line through the town, on certain streets, to the Golf Club. It was claimed that the company was encroaching on the streets. The matter was originally referred to the Railway Commissioners, who, in the absence of opposition, ruled in favor of the company and endorsed their plans. The absence of opposition was due to the town not having received, through the date of hearing being changed, notice of the meeting, though the Railway Commissioners stated that due notice had been sent. Mr. Justice Laurendeau has decided that, the question having come before the Railway Commissioners, the judgment of the latter on questions of fact is final ,and he therefore dismissed the injunction proceedings.

Canadian Light and Power Company

The September issue of the Electrical News contains a very complete descriptive article of the new power plant of the Canadian Light & Power Co., which has just commenced operations. Owing to a composer's error we omitted to give credit for the engineering work in connection with this magnificant plant to the Messrs. J. G. White & Co., of London and New York. Throughout this work Mr. Joseph D. Evans was the resident engineer for this company, and had immediate supervision of the construction work.

Sherbrooke Railway & Power Extension

The directors of the Sherbrooke Railway and Power Company have authorized the issue of three hundred thousand dollars in additional bonds in connection with the recent purchase of the Eastern Townships Electric Company, the Lennoxville Light and Power Company, and Stanstead Electric Company, and for extending the distributing system of these companies.

St. Jerome Project Delayed

The tenders for the proposed hydro-electric power and distribution system at St. Jerome, Que., have been returned unopened. The municipality decided, after inviting tenders, that the time was inopportune for raising the $60,000 required for the works, and that the scheme would have to be postponed. Having come to this decision, the council, on the advice of Mr. DeGaspe Beaubien, of Montreal, the consulting engineer, resolved to return the tenders unopened. It is impossible to do any work until next spring, when new tenders will probably be invited.

Miscellaneous

The death is announced, at the age of 82, of Mrs. P. S. Ross, mother of Mr. W. G. Ross, former managing director of the Montreal Street Railway Company.

Allis-Chalmers-Bullock, Limited, have been successful in their tender for transformers for the new harbor elevator. Tenders will soon be invited for other electrical equipment.

The reorganization of The Canadian Fairbanks Morse Company is now complete, the capital being $2,600,000. The following are the officers; Mr. H. J. Fuller, president; Messrs. Thomas MacMillan and P. C. Brooks, vice-presidents; and Mr. E. R. Whitehead, treasurer.

The council has voted $10,000 for the preliminary expenses of the commission to prepare plans for placing the wires in underground conduits. Some work has been done in the way of engaging a staff and preparing the offices.

Mr. Justice Robideoux has granted an injunction against the Street Railway from proceeding with work on a devil strip between its tracks on Marie Anne street. The application was made by the city, who complained that the company had taken 4 feet 9 inches instead of 4 feet of roadway as allowed by the by-law.

Mr. N. Curry, of the Canadian Car & Foundry Company, Montreal, has been nominated as president of the Canadian Manufacturers' Association, and as he is the only candidate will be elected by acclamation. Mr. George H. Olney, of the E. F. Phillips Electrical works, Limited, and Mr. E. F. Sise, of the Wire and Cable Company, have been nominated from Montreal as members of committees. The annual meeting will take place on October 10th.

At a meeting of the city council the question of the smoke nuisance was raised, and Alderman Prudhomme inquired what had become of his motion that the city apply to the Railway Commissioners for an order compelling the railway companies to replace steam locomotives by electrical locomotives within the city limits. Controller Wanklyn replied that it was very difficult to get rid of the smoke nuisance. The presence of smoke was a sure indication of prosperity, and the nuisance was not as great as was imagined. The subject then dropped.

The Street Railway Company has made a provisional agreement with the Park & Island Railway Company to take over the latter's assets on the terms of releasing the Park Company from its indebtedness to the Street Railway Company, paying all its debts and liabilities, and an amount equal to $100 per share for the shares not already owned by the Street Railway Company. Another provisional agreement has also been entered into with the Montreal Terminal Railway Company for the purchase of its assets, the Street Railway Company releasing the Terminal Company from its indebtedness and covenanting further to pay all its debts and liabilities.

Steady Advance of the Western Provinces

Railway Equipment for Port Arthur and Fort William—Moose Jaw Now Operating—Lethbridge to be the Next—Selkirk Closes Contract

Winnipeg E. R. Co's. Rates

The Winnipeg Electric Railway Company have announced that on meter readings taken on and after September 15th, the rates for electric lighting will be as follows: 7½ cents per kilowatt hour, with 10 per cent. discount for prompt payment on bills up to $10; 15 per cent. on bills over $10 and up to $15; 20 per cent. on bills over $15 and up to $20; over $20 larger discounts will be granted.

If customers desire to make contracts extending over three or five years, the company will allow in respect of three year contracts a discount of 15 per cent.; in respect of five year contracts a discount of 20 per cent. The company in the past has not tied any of its electric lighting customers to any definite term of contract, and does not intend to do so in the future, and will leave the question of contract optional with the customer.

The company also draw the attention of present and future customers to the fact that they do not make any charge for any change of connection or wiring; and furthermore, that they have now under construction an additional steam plant to the plant already owned by them, an important fact that will prevent any serious delay owing to conditions over which there is no control in respect to hydro-electric plants. These two plants are separated in order to guard against any serious conflagration or other causes, the total capacity of the two steam plants being approximately 20,000 horse power. These steam plants will be kept alive the year round, and ready to furnish current, either for light or power, on short notice. This will ensure all customers of the company against any serious inconvenience or loss from breakdowns, either to the water power plant or to the transmission line, which would seriously interfere with the distribution of current from a hydro-electric plant.

Port Arthur and Fort William Electric Railway

The Canadian twin cities are rapidly adding to their street railway equipment. The Ottawa Car Company recently supplied two new cars of the P.A.Y.E. type. The rear platforms of these cars are fitted with two double folding doors and three electric lights for the conductors' convenience. Heating is by the hot air forced ventilation system. Capacity is forty-two passengers. Standard colors of dark green and wine, with gold lettering, are used. The electrical equipment consists of four 101-B railway motors, K 6 controllers, Westinghouse air brakes and Brill "G E" 27 trucks.

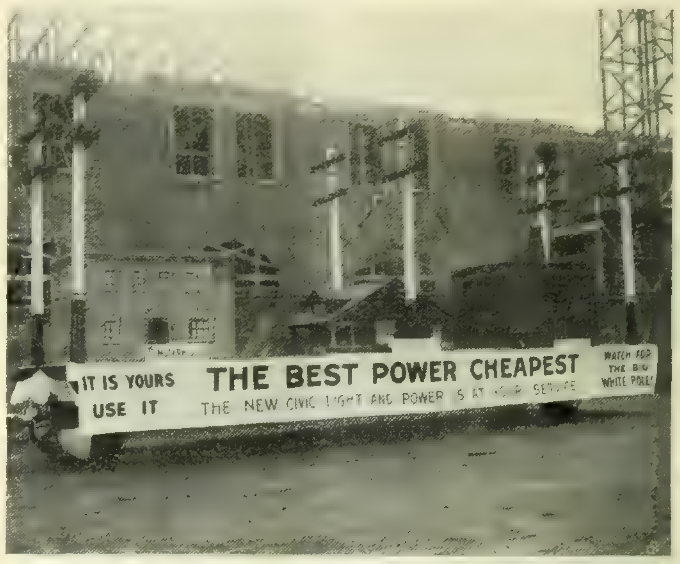
Four other coaches of the P.A.Y.E. system are also on order with the Preston Car Company.

Other extensions and additions include a new single-truck baggage car for handling freight between the two cities; a 750 horse power Siemens' type motor generator, located at Port Arthur, and some 3,000 feet of new heavy steel replacing lighter equipment in Fort William. The line is being extended a half mile on Cumberland street, Port Arthur; also a half mile is being added to the Arthur street extensions. The city of Fort William is building a branch line from the main line on Simpson street running out to the Empire Elevator Company, a distance of approximately one mile.

Mr. M. O. Robinson is general manager of the Port Arthus and Fort William Electric Railway system, with head office in Port Arthur.

Winnipeg City Advertising

A feature in the Labor Day parade which was most favorably commented on, was that of the City Power Department. As shown by the accompaning reproduction this was a float 38 ft. long by 10 ft. wide drawn by six horses and containing a miniature transmission line with models of "The Modern Way" factory and the "Old Way" factory. This float was drawn through the streets at night illuminated by two 150 tungsten lamp festoons and two



Winnipeg Municipal Labor Day Display

large flashing signs. Power was supplied by an eight horse-power gasoline engine driving a 7½ kw. generator on another wagon. The present day ruggedness of the tungsten lamp was strikingly shown by the fact that only a couple of the filaments were broken, in spite of the fact that the festoons caught in trees several times. The "Old Way" factory accidentally caught fire, as per their usual custom.

Selkirk Will Use 100 h.p.

The contract for a supply of one hundred horse power has been concluded between the town of Selkirk and the Winnipeg Electric Railway Company, at a price of $30 per horse power per year, and the following tenders have been accepted:—350 cedar poles, Northern Electric Co. for approximately $1800; pole line material, Canadian General Electric Co., $1,250; wire, Eugene F. Phillips, $4,600; transformers, Packard Electric Co., $12,000; series tungsten street lighting instruments for 115 lights and recording instruments, Canadian General Electric Co., $2,000. Construction work is progressing very favorably and it is expected that Selkirk will be enjoying power from her system within thirty days. They have been without any light since the expiration of the contract with the old company, and they will have day power in the future, which they have

never enjoyed before. The rates for lighting and power are based on the rates current in Winnipeg up to the present reduction, and are 6 cents per kilowatt for power, less discounts on a sliding scale for large amounts, and 10 cents per kilowatt for lighting with 10 per cent. discount for prompt payment. Mr. W. E. Skinner is in charge of the work for the town.

Street Railway for Lethbridge

Plans and specifications are now being prepared for a street railway system in the city of Lethbridge. The original layout will probably consist of about ten miles of track and from eight to twelve cars. A combination substation and car barn will be located within the city limits, in which will probably be installed two motor-generator sets of a total capacity of 700 kw.

The motors will be 2200 volt, 2-phase, 60 cycle, synchronous, self-starting. To take care of this additional load on the power plant the council have approved plans for an addition to the boiler room and added an installation of four boilers totalling 1,200 horse power, including mechanical draft apparatus and economizer. There will also be installed one 1,500 kv.a. high pressure horizontal type turbo-generator, together with its condensing apparatus; one 50 kw., steam-driven exciter and the necessary switching equipment and instruments.

The city hopes to have the street railway in operation by the 1st of August, 1912, so as to be in time for their annual exhibition. The specifications will probably be issued early in October. The total estimate of cost of the power house additions and alterations alone is $120,000.

Mr. Arthur Reid is superintendent engineer of the Lethbridge electric system.

Moose Jaw Plant Operating

The accompanying cut shows the new power station at Moose Jaw, recently placed in commission for the operation of their street railway service by the Moose Jaw Electric Railway Company. The equipment consists of a Diesel oil engine direct connected to a d.c. generator.

Formal Opening of Moose Jaw Generating Plant

Portage Plant is Now Municipal

The citizens of Portage la Prairie have voted to buy the electric lighting plant in that city at a price of $110,000. This plant at present comprises 300 kilowatts in steam driven units, and 500 horse power in boiler capacity. They expect to install another unit and to combine with the plant the city water works. In the past there has been no day load, and a rate for lighting of 15 cents per kilowatt hour was charged, a sliding scale of discounts applying to the rate. Twenty-four-hour power will be provided in the future, and an active effort will be made to build up a large day load. This should mean a great deal for Portage in an industrial way. The most modern methods of organization and management will be applied to the property by the municipality. To this end Mr. W. E. Skinner has been placed in active charge of the work until such time as it has been brought up to date and placed on a good paying basis.

The town of Carberry have outgrown their present 50 kilowatt generator and are replacing it by a 75 kilowatt machine.

Mr. J. H. Schumacher is making a report on the present condition of wiring, etc., for the town of Selkirk.

New Books

Straight Line Engineering Diagrams—by Manifold & Poole. Technical Publishing Company, 604 Mission street, San Francisco, publishers. Price, $3 net. The volume contains a number of computing diagrams giving rapid approximate solutions of the common problems in the design and construction of electrical power systems and similar undertakings. The appendix contains valuable information on the proper treatment of victims of electric shock.

Practical Applied Electricity,—by David Penn Moreton, B.S., E.E., The Reilly & Britton Company, Chicago, publishers. This is the type of book adapted for use in the practical courses of the average Technical school, and is based on a series of lectures given by the author in the department of electrical engineering, at the Armour Institute of Technology, Chicago. The book will be found very valuable to the young man who is desirous of improving his electrical knowledge but who is not able to spare the time to take an engineering course, or it will be valuable as a basis for more advanced college work. It is well illustrated and carefully written.

The Annual Financial Review.—Published by Houston's Standard Publications, 7-9 King street east, Toronto. The Annual Financial Review is a carefully revised summary of facts regarding securities listed on the Montreal and Toronto stock exchanges, and other prominent Canadian companies. It includes the current annual statements of companies; the highest and lowest prices of stocks and bonds on both exchanges, for each month, for ten years; number of shares sold each month for past fifteen months; rates of dividends paid for past years, and other important items in the history of the different companies, such as increases in capital stock, particulars of franchises, when bonds are redeemable, dividends payable, together with a mass of other facts. It comprises 700 pages of solid information, well printed in a clear and concise manner, and is neatly bound in full cloth. The work is very valuable, not only to financial institutions, but also to the general investing public. Published half-yearly, April and November.

Owing to increasing business The Duncan Electrical Company, Limited, of Grey Nun street, Montreal, have secured an additional 12,000 square feet of space

Electric Railway Operations

Single-Phase 15,000 Volt System for Swiss State Railways

The Daily Consular and Trade Reports under date of August 28th, published the following statement in reference to the electrification of Switzerland's State Railways.

"I am able to state on the highest possible authority that the report of the Swiss Commission which has been investigating the question of the electrification of the Swiss national railways will recommend the adoption of the overhead system similar to that which is now in use upon the London Bridge-Victoria & Crystal Palace Lines of the London, Brighton & South Coast Railway. This decision has been arrived at after a most careful comparison with the third-rail system as adopted upon the underground railways of London and other electric railways in this country.

"The importance of electric railway working was fully recognized by the Swiss State authorities as far back as 1904, when a commission of twenty-two experts was appointed to study the matter. Up to the present time three reports have been issued by the commission; the first deals with the probable power requirements of the whole federal system, consisting of 1,830 miles; the second concerns the nature of the traffic, and the third deals with the most suitable system, that is, continuous current or alternating current. The report about to be issued will recommend the adoption of a single-phase, alternating-current system with a pressure of 15,000 volts in the overhead wires. The first work to be taken in hand will be the conversion of the St. Gothard Railway, and comparative estimates have shown that the adoption of the third-rail continuous current system, so much in use in London, would involve a capital expenditure of about eight per cent. more than with the overhead system.

"The total cost of conversion to electric traction upon the overhead system is estimated at $13,140,000, while the running costs are estimated at about ten per cent. less than the present cost with steam traction. Although no specific sums were mentioned in the Swiss budget for 1911 for the electrical equipment of railways, certain amounts were included for the acquisition of water power for the generation of the necessary electrical energy and also for further preliminary calculations and estimating work."

Trackless Trolleys

Two cities in England are solving their suburban transportation problems by installing trackless trolleys as used to a considerable extent on the European Continent. The city of Leeds is now operating a line 4 miles in length connecting outlying suburbs with the centre of the city. In Bradford the system is used to connect two existing tramway routes which are 1¼ miles apart. A general view of the coach is shown in an accompanying sketch. A double pole is necessary on account of there being no return system through ground.

The Leeds system comprises a route of considerable variety, presenting all the normal conditions met with in both city and rural localities. Starting at the city square, a busy junction of tramway system, it follows the tramway line for about a mile. On this section the railless car uses the same positive wire as the tramway, the return circuit being completed by means of a shoe hinged to the under frame of the car. On a portion of the line much vehicle traffic is encountered. No difficulty is experienced however, in passing this kind of obstruction. The trolley is of the under running type and allows the car to run at a radius of 16 feet from the centre of the trolley wire. The line also runs under four railway bridges varying in height from 14 feet 9 inches to 16 feet.

The Leeds cars have an entrance in front and no conductor is required. The Bradford cars have their entrance at the rear and are in charge of a conductor. All the cars have a seating capacity of 28 and the following dimensions: Length over all, 20 ft. 3 ins.; length over body, 15 ft.; length over driver's compartment, 4 ft. 3 ins.; width over all, 7 ft.; width of interior of body, 6 ft. 5 ins.; height of roof, 10 ft. 8 ins.; height of driver's platform, 3 ft. 6 ins.;

Trackless Trolley Car in Operation in England.

wheel base, 13 ft.; centre of wheel truck, 6 ft. 3 ins. The weight of the car when fully loaded is about 5 tons. Each car is driven by two motors 20 B.h.p. capacity, 525 volts, 1050 r.p.m., designed to give a speed of 10 miles an hour. The controller is of the series parallel blow-out type provided with special arrangement for cutting out either motor.

The cars in both cities are said to run smoothly, silently, and to be under perfect control. The trolley, which might be expected to be the most troublesome feature is said to work admirably and does not leave the wire under the most trying conditions. The overhead equipment for these cars costs in the neighborhood of $6,000 a mile and the cost of a car is much the same as of the ordinary rail car.

New Type of Electric Locomotive

A distinctly new type of electric locomotive has just been tried out on the Paris-Lyons-Mediterranean Electric Railway, in France, and it described in a recent issue of the "Revue Generale des Chemins de Fer et des Tramways." The principle underlying its construction is an invention of M. Auvert, chief engineer of this railway, by which he converts alternating currents to direct currents using a machine called a permutator. The permutator may be described in a general way as a synchronous converter, in which all the parts are stationary except the brushes, which revolve about the commutator. The brushes are operated by a synchronous motor and rotate synchronously with the field which is itself rotary in the same sense as is the field of an induction motor.

It is claimed for the permutator that it is a distinct advantage over a synchronous convertor in that the moving parts are very light, resulting in a great reduction in bearing friction and providing for much greater freedom

in construction. A high efficiency is also claimed. The new locomotive, on which tests are yet being made, is a 150-ton, double unit type. The principal apparatus required for its operation is a transformer which supplies current to the synchronous motor operating the permutator; a second transformer which supplies the permutator; and two permutators supplying current to the motors, of which there are two in number on each driving axle. These motors are 300 volt direct-current, 6 pole, series connected, the current being supplied by the permutator at 600 volt d.c.

The feeder lines supply single-phase current at 25 cycles and 11,500 volts. The return circuit is made through the rails which are connected about every 500 feet to a return overhead cable. The new locomotive will develop a maximum speed of approximately 50 miles an hour.

Remote Control for Electric Cars

The Boston Elevated Railway Company now has had in service for about four months, on its surface lines, 50 equipments of Westinghouse No. 306 interpole motors with Westinghouse HL control. The cars on which these were installed have operated so successfully that an order for 50 more equipments has been placed. This company operates the elevated and surface lines in Boston and also the new Cambridge subway. The cars operate on the surface but connect with the elevated lines. This installation is particularly noteworthy in that the Boston Elevated Railway Company is the first company to adopt, on such a large scale, unit switch control for surface cars in city service. This form of control is claimed to represent one of the greatest achievements in electrical railway progress in the past decade, and it is predicted that in approximately 6 to 10 years the now popular platform type of controller will have outlived its usefulness and that HL or some similar type of remote control will be generally adopted. While HL control weighs but a trifle more, and in some cases even less, than the former platform type K control, it removes entirely all heavy-current carrying parts from the car platform and eliminates the numerous accidents due to controller explosions and the resultant annoying and expensive damage claims and repairs.

With HL control, all heavy motor currents are carried by conductors underneath the car, only the small master controller being located on the car platform. Consequently when controller burnouts or explosions occur, the passengers are so far removed that they are out of danger. A smaller number of switches is employed with the HL system than with any multiple unit control system heretofore used. The number of interlocks is also reduced, which minimizes the maintenance cost. Line current is used for operating the switches, and a form of resistance is used in series with the valve magnets that is practically exempt from injury by inexperienced or careless operators.

Hungarian 1650-Volt D.C. Railway

According to the Street Railway Journal the management of the Arad-Hegyalja Railway in southern Hungary has recently determined to replace its gasoline-electric cars by a 1650-volt d.c. overhead system. The total length of track operated is 58 kw. (36 miles). The gage is 1 m (39.37 in.). During the hours of heaviest traffic motor-car trains will be operated on thirty minutes headway. The motor cars will be of the double-truck type and will carry four 50-h.p. motors each, connected two in series during running. A motor-generator set on each car will furnish low-tension current for the multiple-unit control, lighting and compressor. The 1650-volt overhead line will be of the catenary type and will be equipped with weights to secure automatic tension adjustment. The Ganz Company, of Budapest, expects to have the line ready for operation early in 1912.

Personal Mention

Mr. H. W. Price has been appointed Associate Professor of Electrical Engineering in the University of Toronto.

Mr. J. H. Fuller, president of The Canadian Fairbanks Morse Company, Limited, has been elected director of The Eastern Townships Bank, Sherbrooke, Que., in succession to the late Mr. S. H. C. Miner.

Mr. Morgan W. Holmes, of the firm of Holmes & Irving, was married on September 7th, to Miss Bessie Toovey, daughter of the Rev. W. Toovey, Thame, England. Mr. Holmes is a son of Dr. Joseph Holmes, at Leeds, England.

Mr. J. A. McCrossan, City Electrician of Vancouver, who has been absent on sick leave for some months is again enjoying his usual good health and has resumed charge of his department.

Mr. Ormond Higman, Jr., B.Sc., of Vancouver, B.C., has been appointed chief inspector of gas and electricity for the western division of Canada, including the provinces of Manitoba, Saskatchewan, Alberta and British Columbia. Mr. Higman's headquarters will be in Vancouver, where a branch of the Electrical Standards Laboratory is being established.

Mr. G. S. Stewart, until recently connected with the Toronto District office of the Canadian General Electric Company, but now transferred to this company's Montreal office, was married recently to Miss Calvert of Strathroy. The best wishes of the many friends of Mr. Stewart along the North Shore go with him in his new district and his new home.

Prof. L. W. Gill, B.Sc., Professor of Electrical Engineering in Queen's University, Kingston, has been attending the Turin Congress of the National Electro-Technical Commission, which met in Turin, Italy, during the first two weeks of September, as the representative of the Canadian committee. It is expected that Prof. Gill will have a very interesting report to make upon his return.

Mr. J. D. Evans has been appointed supervising engineer and superintendent of construction for the Montreal Street Railway Company. He is also resident engineer for the J. G. White & Company on the Canadian Light & Power Company's works. Mr. Evans received much of his technical education in Boston, and has been in charge of engineering and construction work in Canada, the United States and the South American Republics. Prior to coming to Montreal Mr. Evans had charge of the engineering and construction work of the Buffalo, Lockport ,and Rochester Inter-Urban railways.

Mr. Frank Smallpiece, Assistant Manager at Montreal for the Canadian General Electric Company, has tendered his resignation, to become associated with J. W. Campbell, of Calgary, in the General Supplies Company of that city. Mr. Smallpiece has been connected with the C. G. E. Co. for thirteen years, and was for some time engaged on steam turbine work. He was appointed assistant manager of the Montreal office about three years ago. He is highly esteemed not only by his personal friends, but by his numerous business acquaintances, all of whom will wish him abundant success in the new field he has chosen.

Magneto Switchboard for Mount Albert

The traffic of the Mount Albert Telephone Company, Mount Albert, Ontario, is now being handled over a new magneto switchboard fitted with improved apparatus which allows service practically as fast as that obtained from a common battery switchboard of the lamp signal type.

The installation consists of a single position section of unit type cabinet to which additional sections may conveniently be added from time to time as the system grows. The woodwórk is of oak throughout provided with a dull light oak finish which presents a very durable surface to the constant wear and tear to which switchboards are exposed. The design of the cabinet ,as shown in Fig. 1, is extremely plain and devoid of the usual dust-catching mouldings and crevices. The entire rear panel of the switchboard is made removable, which, together with the hinged keyboard offers ready access to any part of the apparatus. The plugboard and pilot rail are inlaid with heavy leather to protect the woodwork against possible injury due to falling plugs.

All of the lines, both local and rural, are terminated one self-restoring drops of the unit removable type mounted in strips of five on steel mounting plates, three panels wide. The shutters of the line signals are of the segmental type exposing to view one curved and two plain surfaces when the line signal is displayed, enabling the operator to locate the source of the incoming call from any view angle. The entire face of the switchboard is of steel construction with a Bauer Barff finish which forms a striking contrast to the aluminum sand-blasted finish of the drop shutter in its call-announcing position. The line jacks associated with each drop are of the double cut off type, provided with heavy german silver contact springs, [illegible] insulated from each other to insure against leakage and resulting cross talk. A unique relation between the armature and the drop shutter insures its positive operation under most trying conditions. In fact it has been demonstrated that the signals will operate satisfactorily with the cabinet inclined backward to an angle of 25 degrees from the vertical.

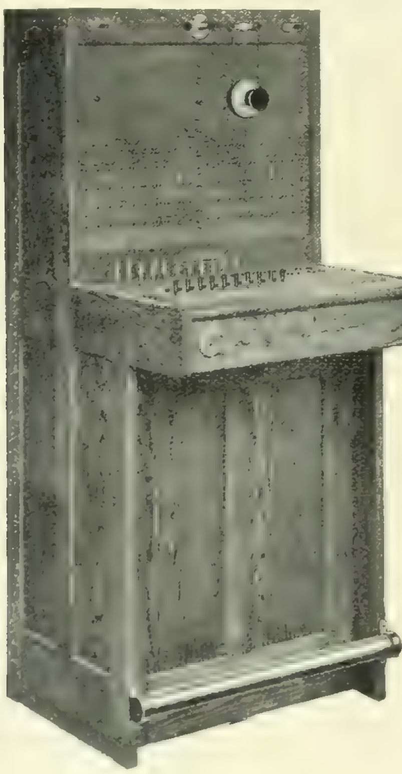
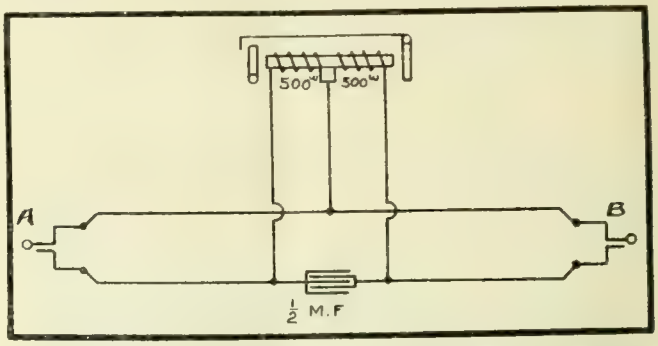


Fig. 1

Telephone men will find the connecting cord pair equipments and their circuit arrangement of keen interest.



Cord Circuit Arranged to Ring Off When "Dead Short" on Opposite Cord.

The usual practice of mounting the clearing-out signals in the face of the switchboard has been departed from, and the supervisory signals mounted just back of the ringing and listening keys on the same key plate. The shutter is encased in a small housing and is visible to the operator regardless of her position. Upon actuating the listening key, the shutter of the supervisory signal is automatically restored for the next call.

Fig. 2 shows the schematic arrangement of the cord circuit, which is designed to insure positive operation of the clearing-out signal under all operating conditions. On switchboards employing the usual bridged clearing-out drop, considerable trouble is usually experienced in obtaining supervision over a connection of a short town line and a long, heavily loaded rural circuit. This trouble is due to the fact that the series telephone ringers provide a path of low resistance around the winding of the clearing-out signal, leaving insufficient current flowing through the winding to operate the drop satisfactorily.

By referring to the circuit diagram, it will be seen that the winding of the clearing-out signal is of the "Split" type, each half of the winding measuring 500 ohms. The center terminal of the winding is connected to the "tip" side of the cord circuit, and the two outer terminals to the "sleeve" conductor, separated by a ½-in microfarad Sure-Ring condenser. Assuming that the subscriber temporarily connected to plug "A" is signalling for a disconnection, it will readily be seen that the ringing current is forced to flow through one-half of the drop winding, inasmuch as the condenser offers an apparent high resistance to low frequency ringing currents. This condenser, however, does not interfere with the transmission of high frequency voice currents through the cord circuit.

The operator's equipment comprises a standard long distance transmitter suspended by flexible cords from an adjustable transmitter arm, together with operator's head band receiver with cord and detachable plug. A cut-in jack equipped with battery contacts is mounted in the key shelf rail to the left of the operator. The energy for the operation of the operator's telephone set is drawn from a bank of three gravity cells. The necessary current for ringing purposes is furnished by a standard pole changer,

but a five-bar generator is mounted in the rear of the cabinet with crank shaft extending through and projecting from the right hand side of the section, to be used for emergency purposes. This equipment can be quickly thrown into action by the manipulation of the generator key located in the upper portion of the face of the cabinet.

The battery and ringing leads, likewise the interposition trunks and order wires, are terminated on a terminal board mounted in the lower portion of the rear of the cabinet. The line equipments are wired direct to switchboard cables which extend fifteen feet from the base of the section to the protector rack.

All of the equipment required for this modern installation was furnished by the Stromberg-Carlson Telephone Manufacturing Company, 72 Victoria street, Toronto, Ontario.

Train Despatching by Telephone

By H. W. Fairlie

The remarkable impetus which has been given during the past few years to the use of the telephone for handling train orders has been made possible by the developments that have been made in selective signalling apparatus. The advantages that such a system would possess for railroad use have been the chief incentives for the improvements that have taken place during the last year or so.

The use of the bridging system with magneto instruments was limited to roads with short divisions and light traffic. This resulted from the fact that an increase in the number of way stations brought about not only a decrease in transmission efficiency but also loss of time in calling due to the complicated ringing codes necessary. To overcome this, the development of the new Western Electric selector was undertaken, and how well the purpose has been achieved is attested by the experience of many of the leading roads.

In its design it is simplicity itself. As a result its operation has demonstrated that its ruggedness of service is directly proportional to its freedom from complication. In actual use on railway lines handling the heaviest traffic, the operation of this selector has more than exceeded the most sanguine prophecies of its friends. With tests made under the most exacting conditions it has responded to over one and a half million calls without showing the least failure in any of its working parts. This is the equivalent of the service that would be demanded by over twenty-nine years service on a road handling a trunk line traffic. Results like these have been the cause for the speed with which the leading railroads are specifying this selector in preference to all others.

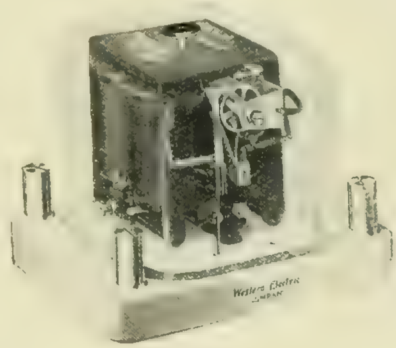
The selector itself bridged across the line in every way station consists of two electro-magnets connected in series. Although these magnets are identical in appearance, they are essentially different in construction. The one is characterized by its slower action while the other will respond to very delicate impulses of current. The first impulse in every call sent out by the dispatcher's calling-key consists of a long impulse. This actuates the slow acting magnet which remains in this operating position during all the rest of the call.

Connected with this armature is a retaining pawl which comes into operation with a small ratchet wheel at the very beginning and is never released till the call is finished. Connected to the sensitive armature is the stepping-pawl which steps this same wheel up as many teeth as there are shorter impulses succeeding the longer primary one. This wheel carries an adjustable contact which will engage with an exterior stationary one, close the circuit and ring the way station bell. By this arrangement, a selector that rings the bell in response to a certain number of impulses will only do so when this particular call has been sent over the line. Since the dispatcher has an individual automatic key for calling every station, all he has to do is to give a quarter turn to the proper key to call the point desired.

When the bell rings, it makes and breaks an auxiliary contact which closes and opens a battery circuit across the line. This gives a characteristic 'answer back' signal in the dispatcher's receiver. By this means he at once knows whether the station has been properly called or not.

In addition to the extreme simplicity of detail, this new type of selector will commend itself to every repair man by the accessibility of all working parts. As it has been explained, every selector can be adjusted to respond to any call, and every dispatcher's calling-key possesses the same degree of flexibility. In the face of frequent rearrangements of apparatus this one feature will commend it to every operator of the dispatching system.

In many instances it is customary to 'send time' over the line every day. For this purpose each instrument has provision made to accomplish this end. By a simultaneous tapping of every bell along the line, the way stations are enabled to compare their clocks with the standard time given by the bell. The rapidity with which this selector will operate is due to the fact that the stepping magnet is designed to operate on current impulses of 1/10 second duration. For all railroad divisions of ordinary size, the ringing is practically instantaneous. Should the dispatcher desire to prolong the ring at the way station, he can do so by closing a strap key which is usually mounted conveniently on the desk in front of him.



Telephone Selector

This type of selector has already been installed on some of the largest railroads of America, and in every instance there has been nothing left to desire in its satisfactory operation. Many roads previously using other types for this work are either abandoning their use altogether in its favor or at least using it for all extensions to their system.

The Northern Electric & Manufacturing Company, Limited, have made this selector the basis of their system of Telephone Train Dispatching, and are recommending its use under a guarantee that leaves no risk with the railroad.

Automatic System for Quebec

The National Telephone Company with head quarters at Levis, situated just across the St. Lawrence River from Quebec City, has just let the contract for the construction of a modern Independent automatically operated telephone

system for the city of Quebec. This will mean direct competition with the Bell Telephone Company ,and constisutes really the first duplication of telephones in any Canadian city of size.

The National Telephone Company, in addition to a large number of subscribers in and around Levis also have a long distance system reaching to the boundary of the province of New Brunswick. It is evident therefore that with the addition of Quebec city and suburbs this Independent system will be no mean opponent of the Bell Company.

It is stated that approximately $400,000 will be expended in Quebec. It is to be full cable, all underground in the business district. The specifications call for an ultimate cable capacity of 15,000 pairs with an immediate installation of 5,000. Upwards of 3,000 stations will be placed in commission at once, and this number will be rapidly increased no doubt, as soon as the service has been installed. One central station will be built at first, to which a little later two branch exchanges, and two special exchanges will be added. At the present time the Bell Company claim to have some 4,200 telephones in and around Quebec.

The system will be of the automatic type, the apparatus being supplied and installed by The Automatic Electric Company, of Chicago. The contract for the construction of the plant has been given to the Montcalm Construction Company.

The number of automatic systems in Canada is now considerable. In the west this Chicago Company has three large centres operating satisfactorily and the Lorimer system has been installed in an equal number of towns in Eastern Ontario. The duplication of telephone systems in a city the size of Quebec will be watched by business men throughout the Dominion with the very closest interest.

The National Telephone Company who have this construction work in hand is the successor to the old Bellechasse Telephone Company, founded by the late Dr. Demers, who was prominent in the Independent telephone field in Canada.

Will Assist Montreal

Mr. Francis Dagger, consulting telephone engineer and secretary-treasurer of the Canadian Independent Telephone Association, has been appointed by the city of Montreal, in an advisory capacity, in connection with the application made by the city to the Board of Railway Commissioners of Canada for a revision of telephone rates in Montreal. Mr. Dagger will begin immediately on the gathering of information and the compiling of figures and will render such assistance in the preparation of the city's case as may be necessary. Mr. Dagger's experience as a telephone expert is very wide. Recently he acted for the city of Toronto at the time the rates in the newly annexed portions were reduced by order of the Railway Commissioners. Previous to that he had acted in an advisory capacity to the Select Committee on telephones at Ottawa, and to the provincial governments of Saskatchewan and Manitoba.

Annual Convention Nov. 15

The Annual Convention of the Canadian Independent Telephone Association will be held in Toronto, November 15, 1911. One of the important matters which will come up will be the consideration of a draft agreement for connection between the Bell Company and Independent systems. This agreement has been submitted to the Board of Railway Commissioners for Canada, for their approval, but the Board has consented to postpone its decision in the matter, until the delegates meeting at this convention have a chance to discuss and submit their views to the Board

Current Notes

The New Deloraine Rural Telephone Company, Limited, has increased its capital stock from $2,500 to $3,000.

The River du Lievre, Quebec, Telephone Company, has been purchased by the James Maclaren Company, of Buckingham.

The B. C. Telephone Company propose building a two-storey addition to their present quarters in New Westminster, B.C.

The Tugaske Rural Telephone Company, Limited, has been incorporated, Edward J. Wright, Registrar of Joint Stock Companies, Regina, Sask.

Mr. W. J. Moses & Son, and others have applied to the Ontario Railway and Municipal Board for connection with and service from the Metcalfe Rural Telephone Company.

The Telephone Company, Lakehurst, has been completed. This line connects Lakehurst and Gannon's Narrows, including about twenty-five houses. Connection will be made with the Bell Telephone Company.

The Bell Telephone Company has applied to the Ontario Railway and Municipal Board for approval of its agreement with the town of Chesley; and the village of Blyth and the township of Colborne have applied to the Board for approval of agreement for intercommunication, &c., between their telephone systems.

Powerful Wireless Station at St. John's, N.F.

In our last issue we spoke of inventions now being perfected by Marconi looking to the transmission of wireless messages for much greater distances than was formerly possible. Plans have now been completed for the erection of a powerful station at St. John's, N. F., which will be the distributing point for all wireless messages between England and Canada and will be the means of keeping all vessels plying between the two countries in constant communication with either end. A temporary transmission plant has already been installed and recently a wireless message was satisfactorily transmitted from Clifden, Ireland, to Premier Morris.

The Dominion government wireless stations on Vancouver Island have on several occasions lately established notable records for long distance telegraphy, but a couple of weeks ago every former record was shattered when the operator at Estevan got into direct communication with the Osaka Shosen Kaisha liner Canada Maru, 1700 miles from the west coast station, the Maru being nearly seven days out from Victoria for Yokohama when spoken. However, this grand showing was eclipsed two days later, when the Maru was again picked up by the station 2,120 miles out. The message received by the island station was not relayed by any other vessel, and as a result Estevan may lay claim to the record for long-distance talking on the Pacific. Some time ago it was believed that the Asteria (Ore.) station had won the laurels. as she spoke the Minnesota 2,090 miles at sea, but on the arrival of the vessel it was discovered that the message had been twice relayed, once by the Nippon Yusen Kaisha liner Sado Maru, and the second time by the Pacific coast steamer Umatilla. At the Estevan station is installed one of the largest and most powerful wireless instruments on the Pacific coast.

The Canadian Pacific Railway has now in operation over 2,000 miles of telephone system for train dispatching purposes, and in a short time the mountain section will be linked up with the prairie system. Just now the work is in progress of installing the telephones clear through from Field to Kamloops.

Questions and Answers

GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.
4. To avoid trouble and unnecessary delay, correspondents should state their questions clearly, so that there can be no possible doubt as to the information required.
5. In all cases the names of our correspondents will be treated confidentially.

Meaning of Term Slip-ring

Q.—Will you please explain the meaning of the term slip-ring, as applied to the modern alternator.

A.—Where alternators have revolving armatures sliding contact is necessary to connect the revolving coils with the external circuits. These sliding contacts are made by connecting the ends of the armature windings to insulated metal rings which are fixed to the shaft. These rings are called slip-rings. The collecting brushes of metal or carbon press against these metal rings and a current is collected and conveyed to the external circuit. The number of slip-rings depends on the number of circuits supplied by the machine. For a single-phase alternator two rings are necessary. In a 2-phase machine having four circuits four slip-rings are necessary. With a 3-phase machine only three slip-rings are needed, as only three circuits are supplied by such an alternator.

"Lag" and "Lead"

Q.—Can the terms "lag" and "lead" be explained briefly and without making use of technical terms that the ordinary man cannot understand?

A.—It would scarcely be possible to explain these terms completely without making reference to certain other technical information which the average electrician is naturally supposed to possess, but the following will probably meet your case. There can be no current except as the result of an electromotive force, or as we say briefly a voltage. If the voltage is an alternating one then the resulting current will be an alternating current and will have the same frequency as the voltage which produces it. If the voltage and the resulting current always kept step with one another, traveled side by side with one another, as it were, there would be no need for the terms lag and lead. This is not the case, however, and under certain circumstances the current does fall behind the voltage or electromotive force; this is termed lag. Under other circumstances the current is in advance of the electromotive force; this is called lead. Lag is caused by self-induction in the magnetizing coil circuit. When the current increases or decreases, the magnetic field of the electromagnets also increases and decreases, thus setting up induced currents, acting in the opposite direction. From this it will be seen that the main current cannot increase to its maximum value as quickly as it otherwise would, or die out as quickly as it would hence the lag of the current behind the electromotive force.

Advantages of Metric System

Q.—We hear a good deal nowadays about the discarding of the English system of measurements and using the French or metric system, in its place. Will you point out any advantages the new system would possess over the old, as it seems to me a change of so great importance would be a great inconvenience to every body concerned.

A.—We believe the metric system possesses many advantages over the English. Chief of all is the ease with which computations can be made in the decimal system. For example, if it is necessary to express a length 3 meters 5 decimeters, 4 centimeters, 5 millimeters, in any one of these four units it is only necessary to write down these four figures consecutively, that is, 3545, and by placing a decimal point in its proper position indicate your result at once; in this case your answer is 3545 millimeters, or 354.5 centimeters, or 35.45 decimeters, or 3.545 meters.

Another advantage of considerable importance is the simple relation existing between the different units of length, volume and weight. As anyone will see on a moment's consideration it is one of the Englishman's most difficult problems to connect these units. Our results are only approximate. For example, we do not know the size in cubic inches of a bushel or a quart; or the weight, except approximately, and by actual experiment, of a cubic foot of water. In the French system, on the other hand, these relations were fixed when the system was devised. The litre, which may be taken as the unit of volume, is a cube which measures exactly 1 decimeter each way and when the litre is filled with water at a given temperature it weighs exactly 1,000 grams.

What appears to be the most difficult objection to overcome is that raised by manufacturers of expensive machinery who are constructing according to English measurements and who claim that it would be necessary to scrap a tremendous amount not only of every manufactured product, but of the machinery used in manufacture. It is also stated that throughout the rural districts it would be a practical impossibility to get people who have grown up with the old system and who are not naturally studious by disposition, ever to grasp the new system. These objections, however, will doubtless be overcome. A very large number of the governments of the world have now made the metric system compulsory. In others it is only optional, and it is quite possible that in the English-speaking parts of the world this system will gradually work its way into general use, even if the governments do not take action.

Principle of Dynamo and Motor

Q.—For the sake of an operator who has not had the advantage of a college training, will you explain simply how a dynamo and a motor operate?

A.—Probably a description of a most primitive type of dynamo and motor would best answer your question. You must understand first that an electric current is produced in a conductor whenever it cuts across lines of force. If you have a simple measuring instrument like a galvanoscope (which you can make yourself by coiling an insulated wire around a block of wood and setting a small magnet needle over it) you can show the effect of moving a coil of wire in a magnetic field. A very suitable apparatus for this experiment may be made by winding from 50 to 100 coils of wire around an old bicycle felloe. It will be found that by simply turning this coil of wire, very quickly, in the magnetic lines which surround the earth's surface, a current will be induced of sufficient strength to move the magnetic needle of your galvanoscope.

The simplest form of dynamo is merely an extension of this experiment. A number of such coils connected together on a common axis and so mounted as to be revolved continuously, would give you a continuous current. You

will probably notice in these experiments that the direction of the deflection of the needle depends on the direction in which you turn the coil ,that is, a complete revolution of your coil produces a current during half of the time in one direction and during the other half of the time in the other direction. Consequently such a simple dynamo as we have described produces an alternating current. This may be made into a direct current by using a suitable commutator.

The simplest form of motor operates in exactly the same way as a magnet needle revolves under the action of a second magnet. If you place a simple magnet needle between two opposite magnet poles the needle will take up its position in line with these two poles, that is, it will make part of a revolution. If, now, the polarity of these magnet poles is reversed at the instant the needle is approaching the position of allignment, its own impetus will carry it slightly past the poles and these having been reversed will cause the needle to continue its revolution for another half circle. By continually changing the polarity of these outer poles the needle may be made to revolve continuously.

The armature of the motor corresponds to the magnet needle except that its poles are electro-magnets instead of permanent magnets. The field coils are also electro-magnets. In the simple motor it is found more convenient to change the polarity of the armature coils than the field coils, but the underlying principle of attraction and repulsion of poles is identical.

Another Type of Interrupter

Q.—We have been experimenting with an induction coil, using the common type interrupter, but this has become worn and the platinum points seem to have been burned off. Is there not some better type of interrupter that might be used We are experimenting at the present time on X-ray bulbs.

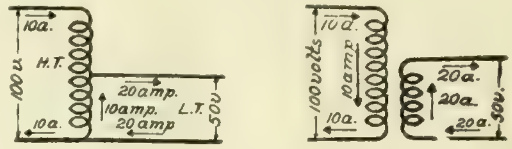
A.—Why not try the Wehnelt interrupter? It is fairly simple to construct and has been used pretty widely in connection with the work you mention. In this interrupter the cathode may be made of lead and is to be immersed in a dilute solution of sulphuric acid (say) 10 per cent. solution. The anode is enclosed in a glass, or better still, porcelain tube having a small hole in the bottom. This also is immersed in the dilute sulphuric acid and so in practice it is found better to tip the wire with platinum, and to coat the rest of the wire which comes in contact with the acid with some material that will prevent chemical action.

The interruptions are caused by the formation of consecutive bubbles of hydrogen on the cathode. These having a high resistance stop the flow of the current until they pass off the point, each bubble causing a short interruption to the flow. By adjusting the distance between the anode and the cathode, the strength of the acid and the strength of the current, the frequency of the interruptions may be widely varied.

Design of Auto-Transformer

Q.—What is the difference between an ordinary transformer and the so-called auto-transformer?

A.—The design of these two transformers can best be understood from the accompanying simple diagrams. The figure on the right represents a simple single-phase, two-coil transformer, that on the left a single-phase auto-transformer. It will be seen that the auto-transformer has only one coil, a certain portion of which is used for both the high tension and the low tension winding. The number of turns of this coil is the same as would be required if it were used exclusively for the high tension winding alone and a separate additional coil were provided for the low tension side. Further, when the ratio of transformation required is exactly 2 to 1, the amount of copper in the one coil is exactly the same whether it is used as an auto-transformer or as the high tension coil of a two-coil



transformer. This means that less copper is required.

In the figures shown the primary coil is designed for ten amperes throughout and 100 volts. The voltage per turn is uniform throughout the coil, so that we may obtain whatever voltage is necessary on the secondary side by selecting any two points on the coil to which include that certain number of turns which bear the same ratio to the total number of turns as the required voltage bears to 100 volts. For example, to obtain 50 volts, as in the figure, it is necessary to include between the two points just one-half the total number of turns. By properly adjusting the resistance in the secondary circuit it is theoretically possible to obtain a current of 20 amperes, flowing in a direction as shown by the arrows. Under these circumstances the upper half of the coil carries 10 amperes, flowing downwards, the lower half of the coil 10 amperes, flowing upwards. This shows how, though 20 amperes is being taken from the transformer in which the coil is only designed for 10 amperes load, no overload is given to the coils.

To Calculate Capacity of Stream

Q.—I have a small stream of water passing through my property from which I could get a head of about 15 or possibly 20 feet. Can you give me any idea what amount of power could be developed and whether such a development would likely prove too expensive to be practicable.

A—Until one have a pretty fair idea of the quantity of water available it is impossible to form any estimate of what power can be developed. Knowing the flow of the stream and the head that can be obtained, the theoretic power that can be developed is easily figured by multiplying the number of cubic feet available per second, by the head of the fall, by 62½, and dividing by 550. This will give you horse-power. Perhaps for your purpose you could form a fair estimate of the flow of your stream by taking approximate measurements of its cross section at some narrow point and by making a rough estimate of its rate of flow noting the distance a piece of wood will travel at this point in a given time. In this way you can make a rough judgment of the number of cubic feet flowing past a given point in one second. Having the number of cubic feet per second this is multiplied by 62½ to obtain the result in pounds. This is again multiplied by the head of the falls in feet to bring to foot-pounds, the English unit of power. Approximately 550 foot-pounds are equivalent to one horse power, so that by dividing by this number you will get the result in horse-power.

Of course we would not advise that you should go into any expense in connection with the installation of a power plant on any such rough calculations as these. Under favorable conditions it is very possible that a water fall such as you mention may be made available at not too great a cost for lighting or even for light power work.

Industrial Progress and Trade Notes

Trade Publications

O-B Bulletin,—July-August issue of the O-B Bulletin on electric railway and mine haulage material.

Catalogue,—of scientific technical books, issued by Whittaker & Company, publishers, London, E.C., and New York.

Information Book,—A little booklet issued by the National Carbon Company, Cleveland, describing the uses and abuses of the Columbia multiple battery for ignition lighting and other miscellaneous purposes.

Braiduct,—A booklet issued by the Flexible Conduit Company, Guelph, Ont., descriptive of a four-walled conduit manufactured by this company and which is claimed to be the best possible mechanical protection for electrical installation.

Paul Instruments.—A booklet issued by the Robert W. Paul, New Southgate, London N., noting some recent improvements in their electrical measuring and testing instruments. The instruments and their interior structure and works are minutely described.

Souvenir Description.—A description of the Mesta Machine Company's plant and of an inspection trip recently made to it by the American Society of Mechanical Engineers, and the Engineers' Society of Western Pennsylvania, published as a souvenir of the occasion.

Commutator Slotting.—A little booklet of information issued by the National Carbon Company, Cleveland, outlining the progress that has been made in the last four or five years, in the slotting of commutators. Much valuable and interesting information of an entirely general character is contained.

Atlas Crude-Oil Engines,—Bulletin No. 201 issued by the Atlas Engine Works, Indianapolis, descriptive of their Diesel type crude-oil engines which are built in 2, 3, and 4 cylinder vertical units. An interesting test report of one of these engines made by C. E. Sargent, M. E., of Chicago is appended.

Alternating Current Motors,—Leaflet No. 10, issued by the T. W. Broadbent Electrical Manufacturers and Contractors, Huddersfield, England, dealing with a.c induction motors for 3-phase and single-phase, 50 cycle circuits. The special feature claimed for these motors is the robustness of their construction, both electrically and mechanically.

Electrical Supplies,—Catalogue No. 15, issued by the Canadian H. W. Johns-Manville Company. The catalogue contains over 400 pages, illustrating and describing the electrical products of this company. There are many new additions to the company's regular lines of electrical supplies. The catalogue is well arranged and completely indexed.

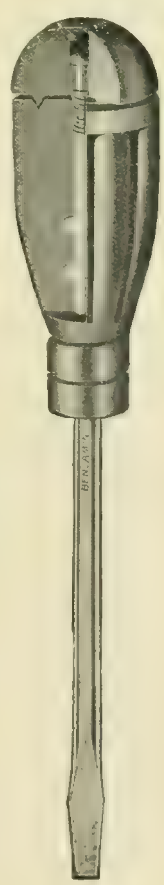
Electrose.—A catalogue issued by the Electrose Manufacturing Company, of Brooklyn, N. Y., who manufacture under Louis Steinberger's patents, various types of electric insulators, suitable for from 1,000 to 100,000 volt installations. Copies of the Steinberger patents covering the strain-insulator, and the high tension strain-insulator, and containing intimate descriptions of these, are appended.

Animal Sanctuaries in Labrador,—An address presented by Lieut. Col. Wm. Wood, F. R. S. C., before the second annual meeting of the Commission of Conservation issued in pamphlet form. The address was an eloquent plea against the wanton destruction of animal life and in favor of the establishment of animal preserves in Labrador, a country well adapted at the present time for such a purpose.

Analogies between battery current and water flow. This booklet, issued by the Canadian National Carbon Co., develops the analogy between currents of electricity and water not only with the idea of giving definite information but also with a view to explaining exactly how far this analogy can be carried in explanation of some of the phenomena connected with the use of cells. The booklet contains a number of helpful illustrations and will prove very valuable to the beginner.

Westinghouse Publications.—Circular No. 1190 published by the Railway and Lighting Department of this company descriptive of Westinghouse engine driven alternating current generators ,type E, also circular No. 1028 descriptive of Westinghouse rotary converters; also folders 4210 and 4217 describing wattmeters type O A for small residence loads, and watt hour meter type C; also a pamphlet descriptive of the Westinghouse electric tailor's iron; also folders 4215 and 4216 descriptive of Westinghouse a.c. and d.c. switch board meters. All booklets and pamphlets well illustrated.

Benjamin "Friction Drive" Screwdriver

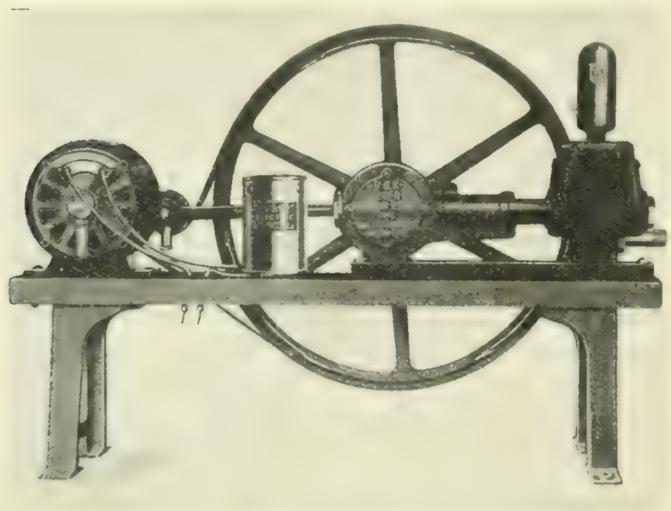


The Benjamin Electrical Manufacturing Company, Toronto, have recently put on the market a new screw driver, which, it is claimed, has many points of advantage over the ordinary driver or the ratchet driver. This new driver is designed to meet the demand for a moderate priced tool, combining the advantages of both the ordinary and ratchet drivers without the attending disadvantages of the latter. The handle is made of composition material, in two parts, the handle itself being moulded to the blade, the rotating cap being held in position as shown in the accompanying cut. The frictional surfaces between the cap and handle engage with the ordinary natural working pressure used in driving the screw, and the spring in the handle releases the friction when the pressure is relieved on the reverse movement and the hand with the cap is returned without backing the screw. Naturally it prevents blisters and injury to the hand. The driver is minus ratchet, teeth or dogs to get out of order and it drives in either direction without any adjustment. The spring maintains a slight pressure on the screw constantly, thus holding the blade firmly in the slot. The few simple parts are designed to withstand the roughest legitimate usage required of a screw driver. On account of the handle being made of insulated composition it is an extremely safe tool when used in electrical work.

V and K Motor Driven House Pump

One of the problems that often confronts the property owner in rural and suburban districts is a troublesome and more or less crude water system. The Vaile-Kimes Company, of Dayton, Ohio, are manufacturers of an electric motor pump, which, when installed with a compression, or pneumatic water tank, makes an independent reliable automatic water system for all purposes. It pumps the water direct from the cistern, well, lake or stream into a tank under pressure, and from there it is distributed to the house.

In cities where water rates are high or where the pressure is low, and where homes are supplied with electricity,



the "V and K" pump forms an efficient and inexpensive means of water supply. It is of sufficient capacity to furnish the average suburban home with water under pressure for bathrooms, kitchen, laundry and sprinkling purposes. The power is obtained from a one-eighth horse power Westinghouse motor.

The first cost of this little outfit is comparatively small, considering its capacity and efficient operation. The operating expense is very slight as the motor is well designed and constructed. The cost of current consumed does not exceed two cents an hour. An automatic switch, governed by the water pressure in the system, controls the operation of the motor. This switch starts the motor automatically when the pressure falls to a given point and stops the motor when the maximum desired pressure is reached. No attention is therefore required to keep up the water supply. The pump is belt driven and is equipped with an automatic belt tightener which keeps the belt always tight. A large air chamber makes the discharge smooth and uniform. The pump may be arranged for mounting on the wall by substituting brackets instead of the legs.

New Branch of National Carbon Company

The new carbon plant which the National Carbon Manufacturing Company of Cleveland, Ohio, are building at Niagara Falls will be ready for occupancy some time in October. The company have been working for about a year in building this new branch, which will be a thoroughly modern factory in every respect and will engage in the manufacture of carbon electrodes exclusively. This is the second plant the National Carbon Company has built during the past year, the other being at Toronto. In nearly every one of their nine factories considerable improvement and expansion has been made during this year. This rapid expansion and development is doubtless attri- [illegible] to the high quality of their products, their service to customers, their long list of various products, and a satisfactory scale of prices.

The main plant and general offices of the National Carbon Company are located at Cleveland. This plant alone covers about thirty acres of ground, and is engaged in the manufacture of a miscellaneous line of carbon products. The eight outside plants manufacture a special line of product for which the locality, equipment and organization is best adapted. The Cleveland plant is said to be the largest carbon factory in the world, while the total facilities of the nine branches make a highly specialized organization for the development and manufacture of a complete line of high class carbon products.

Escher-Wyss Close Large Contracts

Messrs. Escher Wyss & Company, hydraulic engineers of Zurich, Switzerland, Canadian Head Office, 408 Lumsden Building, Toronto, have lately secured an order from the Rio de Janeiro Light and Power Company, Mexico, for two 19,000 h.p. tangential wheels, the largest of their kind, to work under a head of 950 ft. This contract includes delivery of Messrs. Escher Wyss & Company's patent oil-pressure governors as well as the two pipelines complete with valves, etc. Further orders have been received from the Tata Hydro-Electric Power Company, Bombay, for four 13,200 h.p. and two 1,000 h.p. high-pressure turbines designed for a head of 1,680 ft. and from the Fuji Cotton Mill (Japan) for four 3,000 h.p. and one 100 h.p. turbines designed for a head of 280 ft. These orders also include delivery of the necessary number of Escher Wyss & Company's governors. Orders of water turbines booked in the course of last month exceeds 130,000 h.p.

The Canadian Boving Co. Receive Numerous Contracts

The town of Scott, Sask., has just placed an order with the Canadian Boving Company, Limited, for a 100 horse-power Diesel oil engine, of a type similar to those recently installed in Yorkton and Moose Jaw. The town of Wilkie, Sask., has also placed a similar order. The same company has also received the order for some 10,500 feet of pipe line varying in diameter from 10 to 14 inches, and in thickness from 3/16 to ½ inch for the town of Penticton. They are also supplying this town with two turbo-generator units, 100 kw. each, impulse type, designed for a 2050 foot head. A special feature in connection with the turbines is the installation of a modification of the Boving patent pressure regulator, described on another page of this issue. The regulator being installed is similar in principle to their automatic design, in that the nozzle is rigidly placed and the deflector movable about the turbine axis, but the opening and closing of the needle in the Penticton design will be by manual control. This is the first installation of this regulator in Canada, and its operation will be watched with interest.

The Canadian Boving Company has also just received an order from the city of St. Thomas for a steam pumping plant ,having a capacity of 3,500 imperial gals. per minute, under a 58-foot head, direct-connected to a high speed engine; also for an electric pumping plant consisting of a 2,100 imperial gal. pump, 58 foot head, direct-connected to a 3 phase, 25 cycle motor, which will be operated by Hydro-electric power.

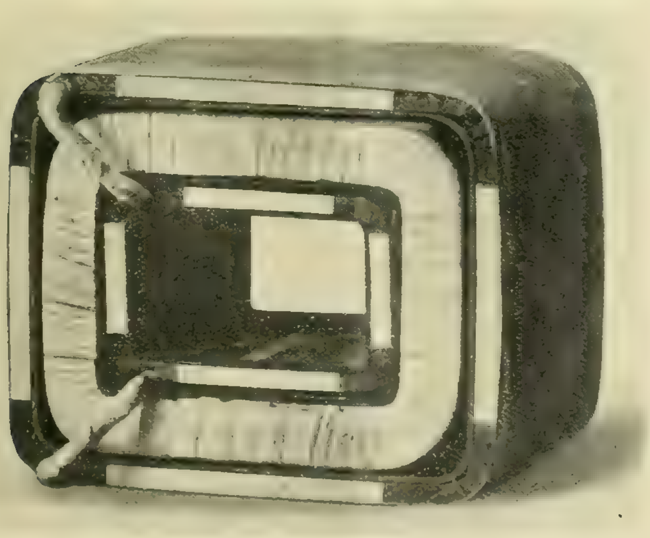
A novel piece of apparatus in the form of a steel conveyor belt, 12 inches wide, and about 400 feet long has just been supplied to the Brompton Pulp and Paper Co. This belt is about 03 of an inch in thickness, being designed to curve slightly, so as to prevent the material it is carrying from falling off. The Laurentide Paper Co. has also placed an order for an elective type rotary screen.

Will Manufacture Electric Elevators

The John McDougall Caledonian Iron Works Limited, have commenced the manufacture of both plunger and electric elevators, for both passenger and freight purposes. To this end they have secured the services of Mr. Thure Larsson, who previous to this appointment was for many years chief engineer of the Standard Plunger Elevator Company, of New York. Along with him they have also secured the control, in Canada, of the Larsson elevator patents, which are considered extremely valuable. For the plunger elevator these patents include a new main valve, designed to eliminate bounding of the car when stopping, a new automatic terminal stop valve, and a new pilot or control valve which prevents any accidental movement of the car in the opposite direction when passengers are entering or leaving. On the electric elevator patented improvements include the good features of the drum and traction type, and are said to give greater security and economy in operation. These elevators will be built in the company's shops on Seigneurs street, where they have just completed eleven passenger and freight elevators of the plunger type, with lifts varying from 40 ft. to 176 ft. for the C. P. R. Windsor Station extension.

Recent Improvements in Distributing Transformers

About three years ago marked improvements were made in the design of single-phase distributing transformers and it was thought for a time that further improvements were practically impossible. These improvements were first embodied in the type S transformer developed by the Westinghouse Electric & Manufacturing Company, and consisted principally in a radically new shell design of magnetic circuit whereby low magnetic reluctance is obtained without increasing the mean length of turn of the winding, and which was especially adapted for the use of the new silicon steel for the magnetic circuit. These improvements resulted in a marked increase in efficiency, better regulation, and a reduction in exciting current, all important characteristics. It is the belief of the designers of this line of transformers that this improved shell type of construction cannot be materially improved upon for distributing transformers of the 2200 volt class. The success of the large number of transformers of this type now in service supports this view. More recent improvements have, however, resulted from improved materials and better mechanical design. The subject of insulation has been given special attention, and the insulating materials now used are of better quality both mechanically and electrically. As a result, further increase in efficiency and reduction of exciting current has been obtained. For example, the 7½ kv.a. type S transformer which formerly had an iron loss of 62 watts and copper loss of 125 watts, now has only 57 watts iron loss and 110 watts copper loss. The exciting current has been reduced from 2.2 per cent. to 1.7 per cent., and the regulation at 100 per cent. power factor improved from 1.69 per cent. to 1.55 per cent. Other sizes show corresponding improved performance. A very uniform temperature is maintained throughout the entire transformer and in no place does the temperature rise exceed 50 degrees under normal conditions. This insures long life and high all day efficiency. In line with the question of insulation, the high tension coils have been further subdivided, to reduce the voltage between the layers of the windings as well as between coils and thus relieve the strain on the insulation. A view of the improved coil is shown in the figure.



Radiant Electric Co. Will Build in Grimsby

The town of Grimsby by a recent by-law voted to loan the sum of $10,000 to the Radiant Electric Company, on condition that they locate a factory in that town for the manufacture of electric heating devices. This sum of money represents approximately the initial cost of the factory, on which work will be begun immediately. A very complete line of electric household and other appliances will be manufactured, including an electric range based on the fireless cooker idea. The president of the company is Mr. M. R. Riddle; sec.-treas., Mr. H. Bottcher; managing director, Mr. F. E. Hewitt.

Montreal Firm Awarded A Large Contract

Word has been received from Winnipeg that the Wire and Cable Company, Montreal, has been awarded the complete contract for the supplying of paper insulated, lead covered power cables for the city light and power development of the city of Winnipeg. The first installment of the order, which is to be delivered this fall, calls for approximately 190,000 feet of cables, ranging in sizes from No. 6 B. & S. gauge up to 1,000,000 c. m., in the single, double and triple conductor type insulated for voltages, ranging from 500 to 5,000 volts. The contract also makes provision for an additional seventy per cent. of the above amount which is to be taken by the city within one year.

High Voltage Transformers

The General Electric Company have just finished the construction at their Pittsfield works of two 500 kv.a. 750,000 volt testing transformers. These are oil insulated, vertical core type. The insulation between the high and low tension windings consists of a number of press-board cylinders which divide the space into numerous oil ducts, thereby assisting the circulation of oil and increasing its insulation strength. Tests taken at night show that little corona is noticeable at 600,000 volts transformation.

Owing to the fact that a number of conflicting rumors have been put in circulation recently regarding the operations of the Canada Carbide Company the officials of the company have authorized the statement that there will be no material change in the policy of the company and no advance in the price of carbide. The plants that were formerly operated by the Willson Co. of St. Catharines, the Shawinigan Carbide Company, Limited, and the Ottawa factory are now owned and operated by The Canada Carbide Company of which Mr. Howard Murray is president and Mr. D. D. McTavish vice-president.

Canadian Crocker-Wheeler Have Contract

The Big River Lumber Company are installing electrical equipment throughout their Prince Albert lumber plant. The apparatus includes a 90 kw. generator and upwards of fifty motors to be used in operating their saw and planing mills. All the apparatus is being supplied and installed by the Canadian Crocker-Wheeler Company, of St. Catharines, Ont.

What Hamilton Will Charge

The following schedule of rates has been announced for Hamilton, Ontario: The flat rates per horse power of maximum demand (h.p. of motors or peak load in parenthesis) are:—(1-3), $37.50; (4-10), $36; (11-25), $33.75; (26-50), $32.25; (51-100), $30.75; (101 up), $30.

The meter rate per kw.h. of consumption is: (1-3), $2.06; (4-10), $2.25; (11-25), $1.09; (26-50), $1.05; (51-100), $1.01; (101 up), 95c.

A ten per cent. discount is allowed for payment of bills within ten days.

The rate for residence lighting is fixed at 4c. per month per 100 square feet of area lighted. Additional charge per kw.h. as metered, 3 cents. The consumer to pay a minimum amount of $1 per kw. of capacity per month. The city will renew incandescent lights free.

Hull Electric Co. Extensions

The Hull Electric Company, head office Deschenes, Que., will shortly place an order for six 50-foot single end P. A. Y. E. cars. In the near future it is also the intention to construct a new car shed having a capacity of 27 cars. In connection with the proposal to adopt the single-end P. A. Y. E. cars loups will be constructed on various points on the line to assist in the working out of this plan. It will also be necessary to increase the generator capacity with the extension of the company's railway operations and to this end a motor generator sub-station will be built and equipped at Aylmer. Mr. G. Gordon Gale is general superintendent of the company and will have charge of these extensions.

Improvements in Kingston Street Lighting

The city of Kingston has overhauled its street lighting system and its streets are now claimed to be among the best lighted in Eastern Ontario. The old 9.6 ampere open arc lamps are being replaced by Canadian General Electric 6.6 ampere magnetite arcs and fifty additional lamps are being installed. Tungsten incandescents to the number of fifty have also been put in. In the very near future the lighting equipment will total 200 magnetite arcs and fifty tungstens. The credit for this work is very largely due to the chairman of the Light, Heat and Power Company, Alderman Elliott, and to the general manager of the Kingston Light, Heat and Power Development, Mr. C. C. Folger.

Branch Office in Guelph

The Flexible Conduit Company, of Penn Yan, N.Y., have established a branch factory at Guelph, Ont., which is incorporated under the name of The Flexible Conduit Company, Limited. They are manufacturing "Braiduct," the non-metallic flexible conduit, and also flexible steel armored conductors. They are located on the opposite side of the River Speed from Taylor Forbes Company, having remodelled the large stone building formerly known as the Morelock property and now have a spacious, convenient up-to-date factory. Their processes are new and novel, and their products are well and favorably known throughout Canada, as well as the United States and other foreign countries.

Government Development of Water Powers in New Zealand

The Government of New Zealand at the last session of parliament empowered the Minister of Finance to raise $2,500,000 for the development of the water resources of the province. The feeling is so strong in favor of government control and operation that the development of these powers has been delayed rather than allow them to get into the hands of private individuals. New Zealand is said to be especially rich in water powers, so much so that it is said that every town, city and hamlet can be furnished not only with power and light but with heat also.

The rapid growth of Vancouver is well set forth in the monthly statistics of the British Columbia Electric Railway Company. The percentage payment to the city for July was $6,779.54, being the largest amount in the company's history. That for June was $6,343.18, while the total for December, 1910, which, of course, indicated the great rush of Christmas shoppers. was $6,509.03. The amount for July, 1910, was $5,307.69. The total number of passengers carried on city and suburban lines during July last was 3,768,558, as compared with 2,771,410 during July, 1910, showing an increase of more than one-third.

The Pacific Electric Heating Company, with headquarters at Ontario, California, and branch factories in New York, Chicago, is about to establish a Canadian factory in Vancouver for the manufacture of electric irons, electric toasters, water heaters and other articles of a similar nature. A building has been leased and for the present the parts of the various electrical appliances will merely be assembled here. The new concern manufactures "Hot point" electrical irons handled by the light and power department of the British Columbia Electric Railway.

The Electrical Association of the Province of Quebec have resumed their monthly meetings; the first was fixed for September 28th. It is under consideration to allot alternate meetings to the English and French members. Many of the members are French Canadians, and it is thought that it will create further interest in the proceedings if every alternate month is allowed for a discussion in French.

The Locke Insulator Manufacturing Company of Victor, N.Y., announces that it has taken over the exclusive handling of the Nicholson arcing rings. These rings are already in service on the lines of the Niagara, Lockport & Ontario Power Company, Chicago Sanitary District, Syracuse Rapid Transit Company, and many other installations.

The effect of electrolysis from the B. C. Electric Company's high tension wires upon the city's water mains is alarming the Aldermen of Victoria, B.C. City Electrician Hutchinson has been instructed to prepare and present a report concerning the damage done to water pipes, whether of metal or other material, and suggest a remedy.

Mr. J. H. Black has resigned his position as Superintendent of the Temiskaming & Northern Ontario Railway, with headquarters at North Bay, Ont., to become General Manager of the Northern Ontario Light & Power Company, at Haileybury, Ont.

Current News and Notes

Alliston, Ont.
A new smoke stack is required by the Alliston Electric Light Co. W. J. Fletcher, manager.

Alix, Alta.
This town has closed an agreement with the Canadian Westinghouse Co. for the installation of an electric plant capable of supplying 1,200 lights. This will include both street and interior service. Cost, about $15,000.

Brandon, Man.
Department of Public Works, Winnipeg. Engineer, A. E. Cope, Brandon. The contract for electrical wiring of the Hospital for Insane has been given to the Brandon Electric Light Co. Contract includes over 1500 lights.

Bracebridge, Ont.
The Ontario Railway and Municipal Board has approved the by-law of the town of Bracebridge, authorizing an expenditure of $8,300 for the extension of their electric light system.

Berlin, Ont.
Superintendent Philip has been instructed to make an estimate of the number of lights required and the probable cost of their installation to replace the present system of arc lighting in this town with tungstens. The opinion of the Commissioners seemed general that the town would not be justified in introducing an expensive system of lighting at the present time, but favored a temporary system, having efficiency as its main object.

Burnaby, B.C.
The Western Canada Power Co. by-law carried by a majority of 145 to 13. The by-law empowers the company to supply electric light to every part of the municipality and to erect towers and string transmission lines in the municipality.

Charlottetown, P.E.I.
The telephone exchange switchboard was recently destroyed by fire here and the city lines were temporarily out of commission unitl a new switchboard could be procured and installed. The loss was estimated at $8,000.

Calgary, Alta.
A by-law will be submitted, October 3, to expend $375,000 on street railway extensions. The requirements include 18 cars, one scenic car, one sprinkler, 100 steel poles, cable, air brakes and vacuum cleaner. An addition to the car barn will also be made and probably one or more substations.

At the present time there are two steam plants in this city, the new one at Victoria Park, and the old one on 9th avenue. In the near future these will both be housed together in Victoria Park and kept ready for auxiliary work in case of accident to the hydro-electric plant at Horseshoe Falls, on the Bow River.

Davidson, Sask.
The town recently passed a by-law by a vote of 31 to 14 to expend $10,000 in the installation of a new electric light plant. The Brydges Engineering & Supply Company will have charge of the installation.

Edmonton, Alta.
The gross receipts in the lighting department for August were $12,883, as compared with $9,772 for August, 1910. A. W. Ormsby, superintendent.

Galt, Ont.
The electors carried a by-law to spend $5,000 in extending their Hydro-electric power service.

Goderich, Ont.
The Brodie power by-law, which was to have been voted on by the ratepayers on August 19, was withdrawn by the municipal council. The immediate cause was a visit of the Hon. Adam Beck, who, in an address before the ratepayers suggested the development of the Maitland River by the Hydro-electric Commission.

Halifax, N.S.
It is reported that the Nova Scotia Power Company, in which Mr. E. A. Robert, president of the Montreal Street Railway, etc., is interested, will commence construction work almost immediately on a power development on the Gaspereau River. It is also said that the power so generated will be used in part, in connection with the manufacture of pulp and paper at some point along the Gaspereau river.

Hazleton, B.C.
The Hazelton Water, Light & Power Company, Limited, has been incorporated, with a capital of $50,000.

Hamilton, Ont.
Temporary lines are being constructed to supply the city parks and institutions with hydro-electric power supplied by the Ontario Commission. In the meantime the supply of light and power to private customers will not be pushed.

Kamloops, B.C.
Motor to drive 100,000 gallon centrifugal pump will be required. Dutcher & Maxwell, Vancouver, engineers.

Listowel, Ont.
A by-law will be submitted to the electors authorizing a loan of $250,000 to the Electrical Supply Company. It is the intention of this company to build a factory in Listowel and manufacture electrical appliances.

London, Ont.
Contracts for electrical equipment for coal chutes, heating and lighting for station, stores and oil houses are to be let shortly by the Canadian Pacific Railway.

Lindsay, Ont.
A by-law will be submitted October 12th authorizing the issue of debentures to be used to purchase the plant, franchises, rights, and goodwill of the Light, Heat and Power Co. of Lindsay.

Montreal, Que.
The new plant of the Canadian Light & Power Company was put in operation on Thursday, August 31st.

The Lancashire Dynamo and Motor Company, of Canada, Limited, with a capital stock of $50,000, head office Montreal, has been incorporated.

Mission City, B.C.
An agreement has been reached between this city and the Western Canada Power Company for the erection of power lines in the district.

Medicine Hat, Alta.
The new electric plant was placed in operation early in September.

Mimico, Ont.
The by-law to contract with the Hydro-electric Commission for power, carried. $7,500 will be spent on equipment.

Neepawa, Man.
Contract for the building of the new telephone exchange has been let to James McIntosh for $11,000.

Niagara Falls, Ont.
Canadian Niagara Power Company, Niagara Falls, plan to install new dynamos, turbines and general power house equipment. Work is now in progress for power house. Contractor for iron work, Hamilton Bridge Works Company. Balance of work to be done by day labor. Estimated cost of extension about $125,000.

North Toronto, Ont.
In spite of the fact that the tenders of both the Toronto Electric Light Co., and the Interurban Electric Co. appear to have been considerably lower, the contract for the supply of electric energy was awarded to the Toronto Hydro-electric Department. The price is $2.14 per horse power per month with discount under certain conditions. Mr. E. A. James, the town engineer, proposes light rates the same as recently published for the city of Toronto, with power rates slightly in advance of Toronto power rates.

New Westminster, B.C.
The B. C. E. R. Company will erect new car barns in this city opposite the present car barns at 12th and Queens ave. The building will measure 240 x 104 feet and be large enough for eight tracks.

Ottawa, Ont.
Negotiations are still proceeding between the owners of Chat's Falls and the Hydro-electric Power Commission, who are acting on behalf of the city of Ottawa, looking to the purchase of these falls by the city.

The capital stock of the Northern Electric & Manufacturing Co., is being increased from one million to five million dollars.

Tenders will be called October 1st for the supply of two booster pumps and electric motors. Estimated expenditure $60,000.

The Ottawa Municipal System, Mr. J. A. Ellis, secretary, will give Ottawa citizens the same rate as is being charged by the municipality of Toronto, namely 4 cents per hundred square feet, plus 3 cents per kw. hour. The Ottawa Electric Company, Mr. A. A. Dion, general superintendent, will meet the city rates. The company is making every effort to satisfy their customers in the matter of rates and announce that they will even give a choice, allow-

us either the present company rate to stand or the new city rate to be used. The city's rates go into effect on October 15th.

Prince Rupert, B.C.
By a vote of 331 to 125, the ratepayers sanctioned a by-law to provide $550,000 for the purpose of installing permanent waterworks and a hydro-electric system.

Surveys being made for supply of power, Khtada River, 42 miles distant. Owner, Prince Rupert Hydro-electric Co.; general superintendent, T. Clark Durant, Prince Rupert. Plans are being prepared by R. F. Hayward, of the Western Canada Power Company, Winnipeg. Surveys being made by Thos. Kennaugh, C.E. Work has begun on construction camp. The company will install a 3,000 kw. plant within twelve months.

A by-law was voted on Saturday, September 2nd authorizing the expenditure of $550,000 for waterworks, electric light and power plant.

Portage la Prairie, Man.
Several inquiries have been received by the power committee for day power which is promised as soon as the customers can install their apparatus. The rate will not exceed 10 cents per kw.h., and will probably be less. The old employees of the Central Electric Company will be retained in the meantime.

Princeton, B.C.
A power site has been furnished and application for water rights made by the Princeton Coal & Land Company. A lighting and power service will probably be installed.

Preston, Ont.
The original amount of 600 horsepower which this town contracted to take from the Ontario Commission will probably be exceeded. It is said there is a 700 horse-power demand already in sight.

Peterborough, Ont.
Ross & Holgate have presented a report on the construction of a power plant by this city, on the Otonabee river, near Lakefield. About 3,000 h.p. can be obtained at this point. The estimated capital cost for the full development is $627,000.

Prince Albert, Sask.
The following equipment for transmission station and line for power development will be required: (a) 3 main units, 3-phase, 937½ kv.a. at 2200 volts, 60 cycle; turbines, 1300 h.p. vertical shaft, 138½ r.p.m.; (b) two exciter units, 125 volts, 150 kw., sheet wound, vertical shaft type, turbines, 250 h.p., 250 r.p.m., vertical shaft; (c) two transformers, 3-phase, 1875 kv.a., 2200-33000 volts, water cooled; (d) 20-ton crane, about 34-ft. span; (e) one set steel winches for moving stop logs; (f) small pumps. Transmission line—27 miles No. 00 aluminum cable (no alternatives), 2 steel towers, 80 feet high; select cedar poles, 35 feet in length (some 45 feet); city will supply insulators; estimated cost of line, including erection and clearing of ground, $32,500.

The ratepayers of Prince Albert endorsed by by-law the proposal to raise $775,000 for hydro-electric development [illegible] to the steam plant within the city limits which will be used as an auxiliary when the hydro-electric plant is operating. Messrs. C. H. & P. H. Mitchell are engineers in charge.

Port Credit, Ont.
This town could use in the neighborhood of fifty horse power of Niagara energy at the start. About half of this would be used for street lighting, and the cost would be in the neighborhood of $24, which would be further reduced if a day load could be obtained. If the town decides to use Niagara power it will be necessary to install a small transforming equipment. The matter will probably be put to a vote in the near future.

Port Arthur, Ont.
The city council has decided to install a system of cluster lights on eight of the main streets of this city. The lights will be placed on the municipal telephone poles. On the busier streets 4-lights will be installed on each pole, on less busy streets only 2-lights.

Quebec, Que.
The Bell Telephone Company has completed an arrangement with the Beauce Telephone Co., for interchange of local and long distance business. The Beauce Company have some 1,200 miles of toll lines extending to thirty-five central offices, located in the principal towns and villages in the neighborhood of Quebec City.

Red Deer, Alta.
The Board of Trade have engaged the John Galt Engineering Co. of Calgary to make preliminary surveys for a hydro-electric plant. Sec'y of Bd. of Trade, R. T. Davison.

Regina, Sask.
The Estevan Gas, Oil, Heat, Light & Power Co., Ltd., has been incorporated. Capital, $20,000. Head office, Estevan.

St. Mary's, Ont.
On October 14th a by-law to raise $15,000 for electric power extensions will be voted on.

Smith's Falls, Ont.
The survey on the Ottawa, Smith's Falls, and Kingston Electric Railway has been completed between this place and Manotick. They are commencing at once the section between Ottawa and Manotick, and expect to be at work between Smith's Falls and Kingston early in October.

Selkirk, Man.
An agreement has been signed between the town of Selkirk and the Winnipeg, Selkirk and Lake Winnipeg Railway Company, a subsidiary of the Winnipeg Electric Railway Company, for the supply of 100 horse power and upwards. The price is $30 per horsepower, which will be reduced to $25 when the amount of power consumed reaches 500 horse power. The town will erect and maintain its own distribution system at an initial cost of about $10,000.

Saskatoon, Sask.
It is reported that work is in progress on the water power development and the street railway system, that the power dam will be built this winter and the railway in the spring.

By-law to expend $863,000 carried, about half will be used in extensions to the present power plant and in the construction of a new plant.

Steelton, Ont.
Tenders will be received till October 3 for equipment for sub-station and lighting and fire alarm systems. Chipman & Power, Toronto, engineers.

Toronto, Ont.
Plans for steel towers to carry 13,200 volt lines across to the Island have been filed with the Public Works Department.

The F. H. McGuigan Construction Co. claims the sum of $412,000 as yet due them from the Ontario Hydro-electric Power Commission for work done in connection with the construction of the Commission's transmission line. The matter will be arbitrated, Mr. T. G. Meredith, K.C., of London, representing the Commission, and Mr. Wallace Nesbitt, K.C., representing the company.

The first of the new extensions of the Toronto railway system was put in op-

eration on the 1st of September. This extension includes a line on Harbord street west to Ossington ave, and up Ossington to Bloor, a total distance of approximately two miles.

The Toronto Electric Light Company will in future supply its customers with both carbon and tungsten lamps at the following cost rates: 5, 8, 10 and 16 c.p. carbon lamps, 17 cents each; 32 watt tungsten lamps, 60 cents each; 40 watt tungsten lamps, 65 cents each; 100 watt tungsten lamps, $1.20 each.

It is expected that all civic street lighting will be operated by the city's own distribution system by about November 1.

The large central heating and lighting plant of the University of Toronto is practically completed. This plant is designed to heat and light every building connected with the University of Toronto. The electric generator capacity installed is in the neighborhood of 750 killowatts.

Thamesford, Ont.
A by-law will be submitted on October 9 to expend $2,293 on a power distribution plant.

Tweed, Ont.
The Tweed Electric Light & Power Company are offering for sale $25,000 of new stock, the proceeds to be used in extensions to the distribution system.

Tilsonburg, Ont.
This town was lighted for the first time by Niagara power service during the first week of September. The citizens are well pleased with the service.

Victoria, B.C.
Proposed extension of street lighting, View street. Owner, City of Victoria; purchasing agent, W. W. Northcott. Plan proposed for extension of cluster lighting system. Provision to be made for arc wires supplying light to James Bay district.

Vancouver, B.C.
The Imperial Power Company have applied for license to use 500 c.f.s. from Thunder River, in the Kamloops district, for power purposes.

It is reported that McKenzie and Mann have bought out the charter of the Couteau Power Company, and their rights at Shuswap Falls, about 26 miles from Vernon. It is now believed that a road, electrically operated, will be built along the Okanagan valley, and that light and power will also be supplied throughout the valley from this source.

Waterford, Ont.
In the near future the ratepayers will vote on the establishment of an electric light and waterworks system.

West Toronto.
Work has been begun on an addition to the Keele street exchange of the Bell Telephone Company, to cost $15,500. The business of the Junction exchange has grown to such an extent that increased facilities were imperative. This new addition will double the capacity.

Walkerville, Ont.
The town council have contracted with the Walkerville Light and Power Co. to furnish current for street lighting at the rate of $154 per month, which includes care and maintenance of lamps.

Welland, Ont.
The council decided to advertise for the lighting of the streets for the coming year. Present contract is held by Welland Electrical Co., and expires Jan. 15. Between 50 and 60 2,000-c.p. lights are in contract.

The Bell Telephone Company have been granted permission to bury their wires on all the principal streets.

Winnipeg, Man.
Tenders are called until Sept. 28 by chairman of board of control for manufacture and delivery of wire and cable and underground line materials.

It is said the Canada Cement Company is negotiating with the city of Winnipeg for the supply of about 1,500 horse power to be used to drive machinery in a new mill which the Cement Company proposes to build just outside the city limits.

Mr. Charles Chamberlain, of the Great Falls Power Company, has asked the city for terms on which they will supply him with a block of 20,000 horse power. Mr. Chamberlain states that if an answer to his proposition is not forthcoming in the near future the company will probably develop either at Silver Falls, or at Great Falls.

Permits have been granted the Winnipeg Electric Railway Company to lay new gas mains along the streets of Winnipeg, the proviso being inserted that the permit is issued without prejudice to the rights of the city, and without recognition of any franchise held by the company.

Electrical News

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The New Government and Conservation

If one may judge what the attitude of the new government will be on the question of the conservation of Canadian water-powers from the attitude of individual members when in opposition, the defeat of the Liberal Government will certainly not jeopardize Canadian water-power resources. During the past two or three years the Hon. Clifford Sifton, chairman of the Conservation Commission, has been a consistent opponent of every attempt to hand over any water-powers which can justly be claimed as belonging to Canada to any but Canadians, for development or use. A similar attitude has been assumed by the Hon. F. D. Monk, chairman of the sub-committee on water-powers. With Mr. Monk as head of an important department in the cabinet, and with Mr. Sifton as closely associated with the government as he showed himself to be during the recent election, there can be little doubt but that these two men voice the sentiments of the Conservative Government as a whole.

It is not at all unlikely that we shall also now see the formation of a Dominion Hydro-electric Commission, formed to operate along lines somewhat similar to those followed by the Ontario Commission, though it is scarcely within the range of likelihood that the arbitrary methods often pursued by the Ontario Government, with respect to matters of electrical policy, will find favor at Ottawa. Such a commission, if composed of men who would place national before party interests, and who would carry along a policy of progressive power distribution with a judicial rather than a vindictive vigor, would undoubtedly do much to further the uniform development of Canadian resources and industry.

Levelling Down the Peaks

A possibility in the operation of Ontario's government-controlled power lines which appears to have been practically overlooked has now been prominently brought to the notice of the interested municipalities by recent statements of the Hon. Adam Beck, that considerably more power has been sold during the month of September than was paid for to the Ontario Power Company. This is certainly good business and is a reassuring answer to the doubts so often expressed during the past few months that the government would, until such time as the system became thoroughly established, likely have to pay for much more energy than it could use.

It emphasizes strongly, however, the decided advantages possessed by such widely distributed systems as this one or as that of the Electric Power Company operating in Central Ontario in keeping the load curve as straight as possible. In the offices of these corporations accurate data are doubtless kept of the time, for each power consuming centre, at which the peak load occurs. Suppose, for example, that in the government system London's peak is at 9.30 p.m.; Guelph's at 8 p.m.; St. Thomas' at 6 p.m.; Berlin's at 8 p.m., etc., etc. This may result in a comparatively even load during the early evening with an undue peak about 8 p.m. The remedy is to be found in consulting with the authorities of those towns where the peak occurs simultaneously, with a view to shifting the load in some way. It is to be presumed that the municipalities being units of the one big popular scheme will readily lend their assistance and even suffer a little inconvenience for the common good. In a privately controlled corporation the same end can be attained, though doubtless in a different way. Orders would go out from the central office to the manager in a certain town that his peak load hour must be made a little earlier or a little later, as the case may be. This may mean the prosecuting of power business and an easing up of the lighting load or vice versa, or a redistribution of one or the other.

The interconnection, throughout large areas, of numerous towns and municipalities for the supply of light and power by one single authority would seem to possess advantages for the consumer and producer alike, such as can only be offered under quite extraordinary conditions by isolated plants.

The International Meeting at Turin

The meeting of the International Electro-Technical Commission held at Turin in September, will probably be remembered as much for the very cordial relationship established between the different delegates as for the important decision reached. This was especially indicated by the fact that, though international politics were in a more or less disturbed state in Europe, a Frenchman proposed the election of a German, Professor E. Budde. to the position of president of the Commission. The total attendance at the convention was fifty-two, representing nineteen nations. This is a good increase over the last meeing in numbers, and it is safe to say that the results achieved were also of greater importance. Considerable progress was made in the discussions treating of the uniformity of nomenclature, symbols, vector rotation and the rating of electrical machinery. Probably the most important conclusion reached was that with regard to the use I E and R, for current, potential difference, and resistance respectively, these symbols being approved by the commission without dissent. Another item of importance was the international adoption of the counter-clockwise direction of rotation for vectors. The Commission weet two years hence at Berlin.

A New Voltage Reduction Scheme

An invention called a "reductor" has recently been brought out by a German firm operating under the name of Reductor-Elektrizitats-Gesellschaft. The reductor is in reality a transformer of very small size, and the special feature in connection with it is that it is made to be installed in connection with the ordinary lamp socket. It is only about five inches in length by two inches wide, is very quickly installed and at its outer end carries a standard socket into which the lamp is inserted. The switch is placed between the wall or fixture and the reductor so that there is not any no-load consumption.

The saving in current with such a device should be considerable. With the present system, when a low voltage tungsten installation is required, a small transformer is installed which cuts the voltage from 110 or 220 down to some sub-multiple of this, but it has been considered an objection that this transformer operates all the time, and so consumes current even when no energy is being used by the lighting customer. It is true that the amount of consumption of a small auto-transformer such as is often used in this type of installation is very small, but the reductor will do away with it entirely in that it is placed between the lamp switch, and the lamp itself.

The pressure used chiefly with the reductor is 14 volts and various types are manufactured which reduce from 110 or 220, or even from much higher voltages down to 14 volts. In efficiency it is claimed that the reductor along with the low voltage filament lamp used, compares very favorably with that of the ordinary tungsten lamp connected up in the usual way. No small part of this efficiency is due to the longer life of the very low voltage lamps and the saving in line loss which is a factor on feed lines carrying so low a pressure. An idea of the efficiency may be gained from figures obtained during recent tests which showed that the current consumption of both transformer and lamp for a 5-candle power lamp did not exceed 1.43 watts per candle; for an 8-candle power lamp did not exceed 1.23 watts per candle; for a 12-candle power did not exceed 1.21 watts per candle, and for a 32-candle power did not exceed 1.33 watts per candle.

It is further claimed that the cost of the reductor is very reasonable, and not such as to render the expense of this kind of installation throughout a building at all prohibitive.

Electro-Bessemer Furnace in England

A steel furnace which is being introduced by Verdon Cutts & Hoult, of Sheffield, is in principle a combination of the Bessemer and the electric furnace. The primary aim of the designers was the reduction of working costs, and therefore they adopted the Bessemer process for making the steel, as being the cheapest, with the electrical method for finishing. The apparatus consists of a double-ended converter, which is mounted on bearings and can be tilted through an angle of rather more than 180 degrees. One end is provided with tuyeres for blowing, and at the other end are the electrodes, with cooling jackets of cold air or water. In use the Bessemer part of the furnace, preheated in the ordinary way, is charged with molten metal direct from the cupola or blast furnace mixer, and is then brought to a vertical position, when the blast comes into operation automatically, and the process of conversion goes on as in the ordinary Bessemer converter. When this is completed, the furnace is tilted and the metal transferred to that portion which contains the electrodes, and which has already been heated by the gases, etc., resulting from the Bessemer part of the operation. Current is then switched on, and refining carried to any desired extent, both arc and resistance heating being obtained in the furnace. It is stated that if the phosphorus content is already low when the electrical refining is started the consumption of energy is less than 100 kilowatt-hours per ton of steel produced, but if both desulphurization and dephosporization are included about 190 kilowatt-hours are required.

Hydro-Electric in Miniature

A unique private hydro-electric plant is in course of construction for Mr. W. M. Boultbee, "The Hollow," near York Mills, North Toronto. The source of power is the Don river which has a flow at this point of 25 cu. ft. per second. A wooden dam has been constructed which will give a head of 9 feet, and a storage reservoir large enough to keep the plant in operation for 3 weeks. A concrete conduit is being constructed around the end of the dam 4 feet below the surface, so as to be out of danger from frost. A 11½ h.p. turbine, vertical shaft, will be installed and geared or belted to a 10 h.p. 110-volt generator. The equipment will be controlled from Mr. Boultbee's house, which will be about ¼ of a mile away, by small electric motors installed on the gates.

The equipment also includes a 110-volt battery for regulation purposes which will float on the bus-bars. Power is to be used to operate two or three centrifugal pumps for house, stable and lawn use. Residential and stable lighting will of course also be attended to.

The installation is in charge of Chapman & Walker, engineers, Toronto.

Portage La Prairie Extensions

Now that the municipality has taken over the power plant and lighting system in Portage La Prairie the present equipment is being doubled. Up to the present they have been operating a 15 and 30 x 36, 120 r.p.m. Goldie-Corliss engine, direct connected to a 300 kv.a. C. G. E. 3-phase, 60 cycle, 2,300 volt generator. The new engine room and its equipment will be an exact duplicate of this apparatus except the condensers. With the old engine a jet condenser was used, but the new condenser will be of the surface type, sufficiently large to maintain a 26-inch vacuum with both engines exhausting into it up to their rated capacity; the old jet condenser will only be brought into use on occasions of overload. The high pressure engine is being connected by an exhaust by-pass direct to the condenser, so that the low pressure engine may be dismantled and the high pressure side only will be operated, until such time as the day load is sufficient to make the operation of both sides necessary and economical.

On November 1st it is the intention to inaugurate a twenty-four-hour service, and though it is not expected that both engines will be working at full capacity at present, it was considered good business to build for the future. The duplication of units, either of which is sufficiently large to carry the load for a short time, will also be found very valuable in case of accident.

The price for day power will probably be placed at 7½ cents per kw.h., but it is expected that this will be reduced in the near future. Some of the light users are yet on a flat rate, and in consideration of the extra service to be furnished these by the continuous service, 25 per cent. will be added to the present flat rate. The option is of course given of installing meters, but it is understood that the former plan is meeting with a favorable reception.

The contract for the new building and foundations for the engine and generator have been let to Mr. A. McLarty. Mr. Russell J. Hill is the superintendent of the electrical department of Portage la Prairie municipal power plant.

Contracts Awarded at Penticton, B. C.

Mr. F. H. Latimer, Municipal Engineer, has awarded contracts for equipment for the new municipal hydro-electric power plant as follows:—two 200 horse power, 900 r.p.m. tangential water wheels to operate under an effective head of 2045 ft., complete with needle nozzles, stream deflectors, oil pressure governors and relief valves, direct connected to two 100 kv.a. 4660-volt, three phase generators with direct connected exciters, made by the Lancashire Dynamo and Motor Works. All the above will be installed complete by the Canadian Boving Company of Toronto. The three panel switchboard will be supplied by the Canadian Westinghouse Company of Hamilton, who will also supply the series tungsten street lighting system and the service wattmeters. The Canadian General Electric Company will supply all line materials including the transformers and multipath lightning arresters. Mather, Yuill & Company, electrical engineers, of Vancouver, are retained by Mr. Latimer in an advisory capacity for the power house and distribution system. Mr. Latimer has also awarded the contracts for the pressure pipe to the Canadian Boving Company for the flanged steel pipe; and to the Evans Coleman & Evans Company for the bell and spigot pipe.

Improvements at Uxbridge Plant

The Uxbridge Light and Power Company have recently renovated the water power end of their generating plant. The system is a combination steam and water plant connected by belts to a common driving shaft. As formerly operated the speed of the turbine was slightly less than that of the engine, so that the water power rather constituted a drag on, than an auxiliary to, the steam engine. The old turbine has now been removed and a new Giant type 34 h.p. 14 inch wheel has been installed in its place. This wheel was manufactured by the J. C. Wilson & Company, Glenora, Ont. The effective head is 28¼ feet. A new penstock was also installed, wood stave, 2 feet inside diameter. The speed of the new turbine is arranged to be slightly in excess of that of the engine, and it has been found when now operating together that the full value of the water power is obtainable even under light load conditions. The owner and general manager of this plant is Mr. I. J. Gould; chief engineer, Mr. John McPhail.

Relative Efficiencies of Prime Movers

At the recent meeting of the British Association held at Portsmouth the relative efficiencies of three prime movers were discussed:—(a) Suction gas engines and producers; (b) Overtype superheated steam engines; (c) Diesel oil engines. The case was presented for each of these by a writer presumably specially selected as being able to bring forward the strongest arguments in connection with his particular type of apparatus and the comparative statements are therefore of great interest, and should prove instructive to prospective purchasers who may be planning to install an electric plant using one of these three types of prime movers.

It is not possible to do either of the papers justice by a short condensed report but some of the arguments brought forward in each case, with a few figures, are given below, in the hope that they may be of value at least in suggesting lines along which investigations should be made before any individual type of installation is decided upon.

Suction Gas Engines and Producers

The case was presented for this type of prime mover by Mr. W. A. Tookey. Figures and curves show the results of producer plants in actual operation. The efficiency of the plants varies considerably with the type of load carried. A continuous load works out much more economically than a day or a night load only in the 24 hours. Tables given in the paper of test performances go to show that from 1¼ to 1½ lbs. of anthracite coal are required per kw.h. Actual working results, however, do not bear these figures out on account of the irregular load and a second table, of working results, shows the best figure, as 1.4 lbs. per kw.h., and the highest as 2.9. Another table gives the actual working combined costs of fuel, oil and labor, for a number of plants, which vary as to cost per horse-power from .25c all the way up to one cent. The most efficient plant was a 96 horse-power using coke for fuel and the most expensive a 6 horse-power using anthracite calculated at 24s. The author draws certain comparisons between the producer plant and the Deisel engine and admits that as far as fuel costs are concerned there is not much difference. He claims however, that the actual outlay for the Diesel engine is greater and therefore also the depreciation costs are greater.

Comparison is also made with a semi-stationary steam engine, the most efficient type of steam engine yet produced. It is claimed that while the consumption of the steam engine is low, the engine cannot be maintained in constant operation, due to the formation of scale and so on. It is also pointed out that constant attendance is required by the steam engine whereas with the producer gas plant the attendant can be engaged in other work giving only occasional inspection to the plant under his charge. The necessity of softening and purifying the water before used in the steam engine is also mentioned as an extra cost.

Overtype Superheated Steam Engines

It is pointed out at the beginning by Mr. W. J. Marshall, the author of this paper, that on account of the severe competition of internal-combustion engines steam engine boilers have recently been improved so that the efficiency of the type which is now known as the overtype superheated steam engine compares favorably, as to fuel cost, with internal-combustion apparatus. The figures are quoted of a 7 hours test on a standard engine, showing that the coal consumption per brake h. p. hour was 1.21 lbs. of anthracite coal. Another test of 12 hours duration showed the consumption to be 1.55 lbs. per brake horse-power-hour, and a further test covering a week's operations in a weaving factory gave the consumption from 1.4 to 1.55. Actual operating tests over considerable periods are unfortunately not presented. Comparative figures of the entire cost of operation of steam, suction gas and Diesel engines are placed, for a 100 h.p. installation, at 175 lbs., 173 lbs., and 135 lbs.; these, however, are calculated and not actual results.

The author states that the actual cost of the Diesel engine is greater and that it requires a more skilled mechanic to operate it. Also a man of less skill can repair a steam engine, and therefore maintenance costs will be less. It is also stated that where there is a great irregularity in the load carried the steam engine possesses greater advantages over the others inasmuch as the steam engine is capable of producing 50 per cent. above its normal loads for considerable periods and of maintaining a low consumption per brake horse-power over a wide range. A further advantage of the steam engine is pointed out to be the use of the exhaust steam for heating purposes, a considerable gain under suitable conditions.

The Diesel Oil Engine

Tables are also given in the third paper of the relative cost of operating the three kinds of plant. These figures

apply to stations not exceeding 1,000 horse-power capacity. The fuel costs of the three in order, steam, gas and Diesel, are placed at .9c., .86c. and .46c. per unit sold. The cost of oil, waste, stores, water and wages in the same order is given as .12, .18, .08c per unit sold. Total cost per unit is placed respectively at 2.04, 2.08, 1.06c.

A very interesting table is given in this paper, which was written by Mr. Chas. Day, on the variations in cost of operating steam plants of different sizes. Figures are given for stations varying from 250 kw. capacity up to 50,-000 kw. capacity and it is shown that the total operating costs per unit sold varies inversely as the size of the plant. The smaller plant cost 2.86c. per unit sold, and this sum is gradually reduced as the plants examined reach the 50,-000 mark, where cost of operation is only .92c per unit sold.

It is pointed out then that the Diesel engine figures for even the smallest plants compare favorably with the cost of operating steam under the most favorable circumstances, that is in the largest stations. It is claimed that the capital expenditure on plants up to 1,000 kw. capacity is practically the same for all three types. The fuel consumption is also very low even on partial loads the figures given being .44 lbs. of fuel oil per brake horse-power on full load, .45 lbs. on ¾ load, .47 lbs. on ½ load and .62 lbs. on ¼ load; these are claimed to be figures taken from everyday operation.

A strong point was also made of the almost perfect continuity of service obtainable with this type of engine and a case is cited of a Diesel engine put in service a little over four years ago in connection with which the station engineer recently made a report showing that the engine had on the average worked 23¾ hours out of every 24 throughout the four years.

An Improved Method of Regulating the Voltage of Alternating Current Machines

Owing to the fact that an alternator requires a much greater exciting current when working on a load having a low power factor, in virtue of a lagging current, than it does when working on a load having a power factor of unity, the alternator will be considerably overcompounded in the case of unity power-factor load if designed so that the voltage is practically constant as the load increases with a power factor of (say) 80 per cent. For the purpose of effecting the voltage regulation of alternating current machines Messrs. Parsons and Law some time ago suggested a method in which the voltage is regulated by varying the current passing round a leakage path of magnetic material placed across the poles of the alternator or of the exciting machine.

According to a recently further improved method, such compounding devices are arranged automatically to supply the right amount of compounding for loads having different power factors by causing the current in the winding of the leakage path to be greater when the load is inductive than when it is non-inductive.

In one form of the improved apparatus the leakage paths or other compounding arrangements are supplied with current proportional to the main current by means of current transformers, the iron circuit of which is interrupted by an inductor or, in other words, a mass of laminated iron mounted so that it can be driven at a speed synchronous with the speed of the alternator. This inductor revolves in a circular bore similar to the bore in which the armature of a dynamo is run and the inductor is so shaped that while in certain positions it completes the magnetic circuit of the current transformer, in other positions it leaves a considerable air gap. This inductor is so keyed on its shaft that when the power factor is unity, the air gap is a maximum or nearly a maximum, and consequently there is a considerable magnetic reluctance in the iron circuit of the transformer at the moment when the current in the primary of the transformer is a maximum. When, however, the current lags behind the voltage of the machine owing to a poor power factor the maximum current in the primary occurs when the inductor is in such a position that the magnetic circuit is nearly complete.

In Fig. 1, **a, a,** is the iron circuit of the transformer interrupted by the laminated inductor **b** which is keyed to the

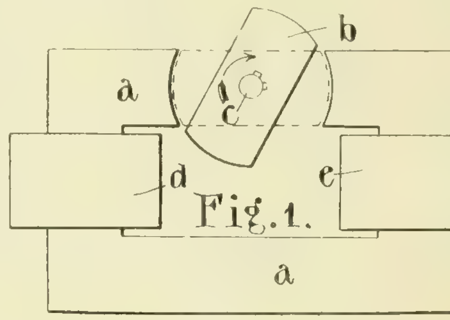


Fig. 1.

rotating shaft **c.** The primary winding **d** and secondary winding **e** are on the fixed part of the iron circuit. The inductor is assumed keyed in a fixed position on its shaft and is shown in full lines in the position relative to the transformer iron circuit at the moment of maximum current for a power factor of 100 per cent., and in dotted lines in the position corresponding to the moment of maximum current and power factor of 50 per cent. In the first of these cases clearly the voltage induced in the secondary winding of the current transformer will be lower than in the second cases clearly the voltage induced in the secondary winding the shaft the current in the leakage path will be less when the current is in phase with the voltage than when it is lagging behind the voltage.

In this arrangement the reduction in current in the secondary windings is effected in two ways. First, the reluctance of the magnetic circuit being increased while the current in the primary winding is a constant, fewer lines of force thread the magnetic circuit; second, if the secondary winding is suitably placed, the leakage co-efficient is greatly increased by interposing an increased air gap and conse-

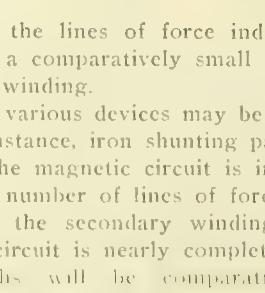


Fig. 2.

quently of all the lines of force induced by the primary windings only a comparatively small number pass through the secondary winding.

If desired, various devices may be used to increase this action. For instance, iron shunting paths may be inserted, which, when the magnetic circuit is interrupted, will allow a considerable number of lines of force to leak back without acting on the secondary windings. When, however, the magnetic circuit is nearly complete, the effect of these alternative paths will be comparatively small. Further, these shunting paths may be made to rotate synchronously in such a way as to cause greater leakage when the power

factor is unity than when the current is lagging behind the voltage and the power factor is consequently low.

The inductors may be driven either directly by the alternator or through gearing or by a synchronous motor.

Fig. 2 shows an arrangement for three-phase working, one suitably shaped inductor **f** being used to interrupt a three-phase transformer circuit. In this figure **g** is the transformer core having three limbs **h, i** and **j,** each limb carrying the primary windings **l** and secondary windings **m,** in connection with one phase of a three-phase alternator. The inductor is shown in the position corresponding to a power factor of 100 per cent. and at the moment of maximum current in the phase represented by the limb **j.**

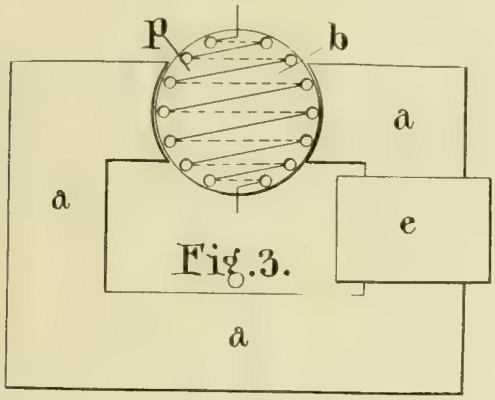


Fig. 3.

According to another arrangement shown at Fig. 3, the iron circuit **a, a,** of the transformer contains an inductor **b,** which carries a winding **p,** the inductor being in a position corresponding to the moment of maximum current and a power factor of 100 per cent. According to this figure the whole of the winding is carried on the inductor, the secondary winding being arranged on the core of the transformer. It will be seen, however, that the primary and secondary winding may respectively be arranged partly or wholly on the inductor and partly or wholly on the transformer core as desired. In cases where the primary winding is wound both on the inductor and on the transformer core, the part on the core may be wound either to assist or oppose the remainder of the winding, and the two parts may be coupled in series or be separately supplied with primary current. The amount of current induced in the secondary winding at the moment of maximum current will depend, of course, on the position of the wound inductor **b** relative to the iron circuit **a,a,** of the transformer at that moment, which, of course, depends on the power factor of the circuit. According to a further modification the synchronously revolving inductor or wound rotor may be applied directly to the leakage path or paths.

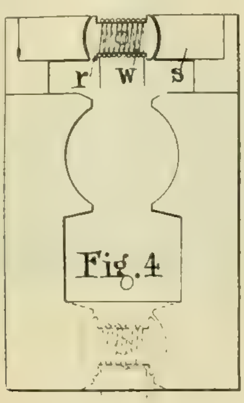


Fig. 4

Considering for a moment the simple case of a single leakage path bridging the poles of a magnet, it is clear that a wound rotor, interrupting the leakage path and carrying in its windings either the main current of the alternator or a current proportional to same obtained from a current transformer, can be so set in relation to the current alternations as to choke back the leakage flux in the leakage path with every alternation of the current, instead of the choking action being limited to every alternate alternation as in the case of an ordinary leakage path with a stationary winding. Further, the relation of the position of the wound rotor on the shaft to the current alternations can be so disposed that its action is much stronger when the current is lagging behind the voltage than when the two are in phase.

Fig. 4 shows an ordinary leakage path **s** interrupted by a synchronously revolving inductor **r,** carrying a winding **w,** which when excited will have the effect of reducing the leakage with every alternation of the main current since with every alternation it reverses its position. If desired such a wound rotor may be used to increase the flux in the magnets with every alternation, as shown in dotted lines in this figure, and can be arranged also to have a stronger action when the power factor is low than when it is high. Also it can conveniently be applied to polyphase instead of single phase currents as described. Further, an unwound rotor can be applied to the leakage paths to increase their action with a poor power factor in which case it would be so set on the shaft in relation to the alternations that with a poor power factor the inductor would keep down the leakage flux in the leakage paths at the moment when little or no current is passing in the leakage path windings; when, however, the leakage flux is effectually blocked by the current in the windings it would be in such a position as to close the magnetic circuit of the leakage paths, but the current in the windings would then stop the leakage. With a high power factor this action would be reduced and consequently the action of the leakage path would be less.

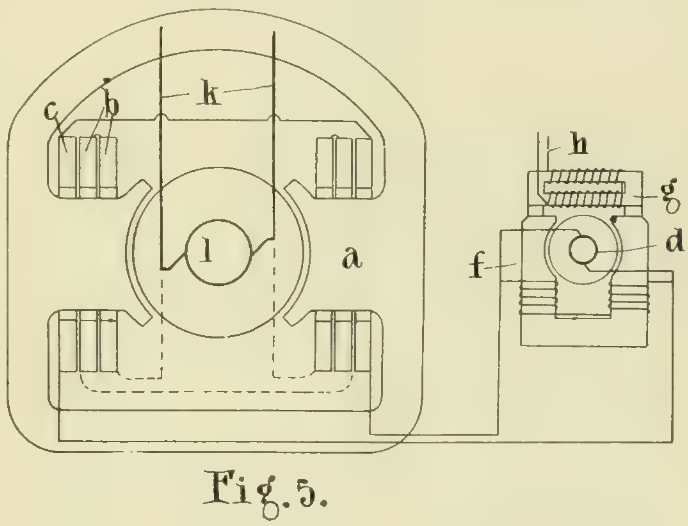


Fig. 5.

A further improvement which Messrs. Parsons & Law have introduced consists in the use of a small auxiliary exciter provided with a leakage path or paths and windings supplied by current proportional to the main current of the alternator, such exciter operating on or in conjunction with the main exciter to regulate the current in the windings of the alternator.

In the form illustrated in Fig. 5, the exciter magnet **a** is wound with four ordinary shunt coils **b** and in addition two coils **c,** which are energized by the armature **d,** of the auxiliary exciter, whose field magnets **f** are wound with a shunt winding and which carries a leakage path **g,** having

a winding **h**, supplied with alternating current proportional to the main current of the alternator. The field of the alternator is connected to the leads **k, k**, from the armature l of the exciter. It will be seen that if the load or voltage on the alternator tends to alter in any way, the voltage of the auxiliary exciter will be affected by the leakage path. This increase in the load of the alternator will increase the current in the coils **c**, energized by the auxiliary exciter and will cause the voltage of the exciter to rise; this in turn will increase the current in the coils **b, b** of the exciter and further increase the voltage.

In this system where the exciter magnets are partially excited by the auxiliary exciter, the exciter magnets can be so designed that the exciter has a practically straight

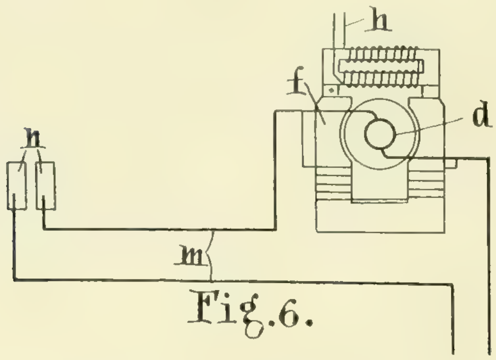


Fig. 6.

characteristic curve and therefore greater advantage can be taken of the building-up action, the auxiliary exciter increasing the field directly and the increase of field inducing an increased voltage which further increases the field. In this manner an exciter may be designed having a very straight characteristic such as cannot be obtained in ordinary working on account of the instability of magnetisation produced by such a design. It will be seen that all the coils of the exciter may be energised from the auxiliary exciter, but in the arrangement illustrated the auxiliary exciter can be made exceedingly small and at the same time a wide range of operation secured.

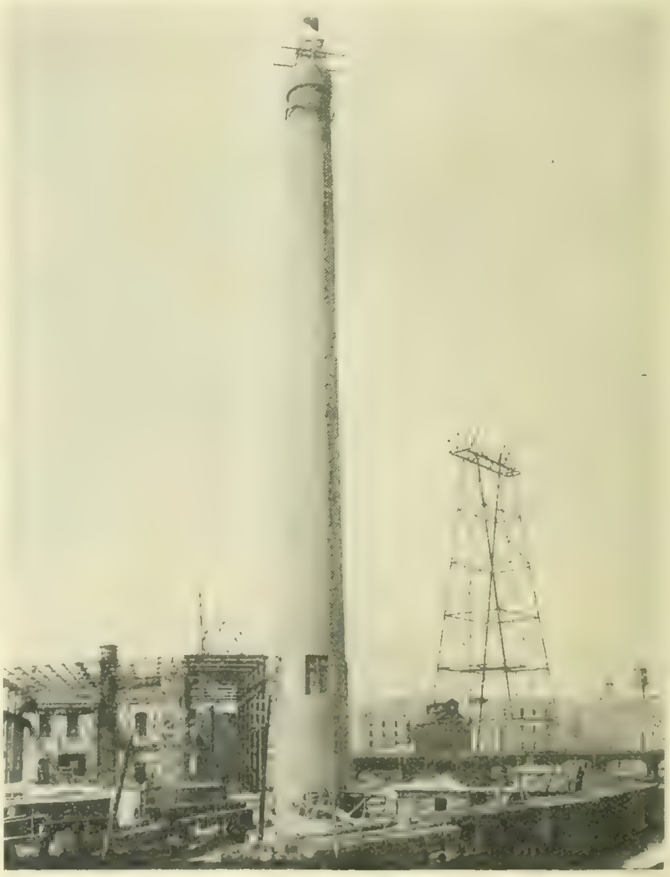
In the modified form shown in Fig. 6 the armature **d**, of the auxiliary exciter is placed in series with the leads **m, m**, supplying current to the slip rings **n, n** mounted on the revolving magnet of the alternator. The current supplied to the leads **m, m**, may be of constant voltage supplied by any source of direct current. In the form illustrated, the field magnets **f**, of the auxiliary exciter are provided with a leakage path **g**, having windings **h**, supplied with current as before from the alternator, so that the current given by the auxiliary exciter will vary as the load on the alternator varies. In this case the auxiliary exciter operates as a booster forming a convenient means of regulation for application to a station in which either the main field magnets or the exciter field magnets are excited from a separate service.

It will be seen that the leads **m, m**, in Fig. 6 might, if desired, be made to boost up the field of an exciter instead of that of the alternator. Also in either of the above modifications the auxiliary exciter may supply current to all the field windings of the exciter or to part of them, or may supply all or part of the current to all or part of the field windings of the exciter. It will be seen also that in the case of polyphase machines the leakage paths or other compounding devices may be operated from one phase only, the leakage path winding being operated either directly by the main current or through current transformers or being arranged across a resistance or inductance in the main circuit. The regulating device is thus much simplified. For instance, in three-phase machines as heretofore constructed, in order to equalize the slight lag imposed on the current by the self-induction of the leakage paths it has been found desirable to use three leakage paths, one in each phase. With this improved arrangement, however, it is only required to operate the leakage paths of so small a piece of apparatus, viz., the auxiliary exciter, that the lag imposed is negligible, so that a leakage path can be used in one phase only provided the load in the phases is approximately equal.

In all the above modifications the leakage path or paths may be either in the main circuits or as a shunt to a resistance or inductance in these circuits or may be worked from current transformers. The auxiliary exciter may be either directly driven from the machine or may be driven by a motor, and it will be obvious that rheostats or other devices may be employed where required in the circuits to enable hand regulation to be carried out.

Largest Stack in Western Canada

The accompanying photograph shows the reinforced concrete stack recently erected at the Winnipeg Electric Railway's new auxiliary steam plant. This stack, which is said to be the largest in Western Canada, is 250 feet high, 24 feet in diameter at the base and fourteen feet in diameter at the top. There is also shown the steel frame-



Reinforced Concrete Stack—Winnipeg Electric Railway.

work for the new power house, and the Red River crossing tower for the transmission line to Lac du Bonnet. The building for the new station is now completed and a large part of the apparatus erected.

The firm of Woodmansee, Davidson & Sessions, consulting engineers, Chicago, announce that they have opened another office at 629-630 Wells Building, Milwaukee, Wisconsin.

Motor-Generators, Converters & Rectifiers

A report presented to the International Electro-Technical Commission at their recent Turin Convention

By Silvanus P. Thompson, F.R.S.

1. This report relates to a class of dynamo-electric machinery the object of which is to change or convert electric energy from one form or variety to another form or variety. From this class of machinery is excluded the apparatus called the transformer, which, though it also converts electric energy from one form to another, does so without employing any revolving parts. Also all those apparatus are excluded which, although they act as rectifiers of alternating currents, effect that operation by chemical means or by means of the electric discharge in vacuous bulbs.

2. **Problem of Conversion.**—The problem of converting electric energy of one form into electric energy of another form presents itself in many aspects, and the solution of it has resulted in many types of machinery. It is possible to consider the subject either by classifying the species of the conversion to be accomplished or by classifying the types of machine. Conversion may be required between any two of the following kinds of current: Continuous current, single-phase alternating current, two-phase alternating current and three-phase alternating current. It may also be required, without altering the kind of current, to convert it with respect to voltage, or frequency, or phase relation, or wave form. Further, the purposes for such conversion may be different, as, for example. for boosting, or balancing, or for gaining variable speed in motor work; and the combinations of machines required for the solutions of these problems are in many cases themselves involved in other problems, such, for example, as the production of a generator of constant voltage working at a variable speed.

As to types of machine, there is a transition of construction from type to type; but the following are the principal types: (a) motor generators with two magnet systems and two armatures; (b) motor-generators with one magnet and two armatures; (c) motor-generators with one magnet and one armature carrying two windings; (d) converters (also called rotary converters) having one magnet system and one armature with one winding; (e) cascade converters (also called motor converters) having two interconnected systems of induction motor and continuous-current generator); (f) auto-converters (also called split-pole converters); (g) rectifiers; and (h) frequency changers. As the machines of this last class are to be dealt with by themselves in a separate report, they will be but slightly dealt with here. It is more convenient in the present report to deal with the subject according to types of machine than to classify according to the kind of conversion to be effected. Hence the several types will be considered in systematic order.

3. **Motor-generators with Two Field-magnet Systems and Two Armatures.**—The crudest and most obvious method of conversion is to select a motor appropriate to the primary kind of current, and to couple it mechanically with a generator appropriate to the secondary kind of current. As we shall see, even in the most modern specialized machines to be considered, the apparatus can always be regarded as consisting of two parts, a motor part, with a generator part superposed upon it; and the two functions of the parts may be distinguished even if the parts themselves are so blended as to be mechanically indistinguishable. The mechanical union upon one shaft, or upon two shafts mechanically coupled together, of a motor and a generator is a very old device. Long-distance transmission of electric energy involved from the first high voltage, and also in practice involved the use of alternating currents. Distribution of electric energy in a local network for lighting, power. traction, etc., involved low voltage, and in the majority of cases involved the use of continuous currents. So the particular problem of conversion which presented itself earliest and on the largest scale to engineers was the problem of conversion from high-voltage alternating current (mono-phase in earliest times, three-phase in recent years) to low-voltage continuous current. This kind of conversion still remains the dominant kind. An early example of machines so combined is furnished by the motor-generators installed in 1890 in the town of Cassel by Dr. Oscar von Miller, consisting of a synchronous monophase alternator of 66 kv.a., working at 2,000 volts, coupled mechanically at each end of its shaft to a bipolar continuous-current generator giving each 210 amperes at 110 volts, the two generators feeding the two sides of a three-wire network. Modern motor-generator sets almost always consist of high-voltage three-phase synchronous motors coupled to low-voltage continuous-current generators. All the chief constructive firms of Europe supply such motor-generators for traction and lighting, and they are in extensive use. Such machines have no electrical connection whatever between their two parts. The whole of the electrical energy supplied (save the inevitable losses) is converted into mechanical energy delivered to the revolving shaft, and is at once reconverted into electrical energy in the generator part. Such machines are not self-starting, but must be brought up to synchronism either by being temporarily supplied on their continuous-current side, or else by means of an auxiliary induction-motor used as starter. As there are in them two sets of electrical and magnetic losses, as well as mechanical losses, the efficiency is limited. But they have the advantage that the regulation of the power factor on the primary side and of the voltage on the secondary side can be independently effected by varying the respective excitations of the two field-magnet systems.

Such motor-generators can also be used for the converse problem of converting from continuous current to alternating current.

Motor-generator combinations can obviously be arranged in other ways. Instead of a synchronous motor, an asynchronous motor can be used, and in this case the machine is self-starting. Also the combination of two different alternating machines as motor and generator might be used to convert from single phase to two phase or three phase, or to change the frequency, or as a phase-shifter, or to alter the wave form or the voltage. Commutator motors for single-phase current do not appear to have yet been employed in motor-generators. They might even be used for the generator parts as well as for the motor part. The combination of an asynchronous motor with a synchronous generator possesses special properties making it useful as a frequency changer.

4. **Motor-Generators with one Magnet and two Armatures.**—Such machines are the first stage toward the synthesis of the two parts. The same field magnet, made broad enough to embrace both armatures, is a possible type of construction, but it limits the applications of the

machine in various ways. With this construction no synchronous alternating-current motor or generator is possible. Voltage regulation takes a different aspect, because any change in the excitation of the magnet affects both parts. Nevertheless, on this plan there have been at times constructed continuous-current converters.

5. **Motor-Generators with one Magnet and one Armature with two Independent Windings.**—The next stage toward fusion of the two parts is to provide a single armature core, but to wind it with two independent windings. If each winding is provided with its own commutator the machine becomes a continuous-current converter, suitable for receiving a current at one voltage and giving it out at another according to the ratio of the number of armature windings. Such a machine was indeed constructed by Gramme as early as 1874. If used as continuous current balancer it is defective, since, as the magnetic field is common to both windings, there is no independent regulation of the voltage by changing the excitation.

By making one winding extend a longer distance than the other (axially) along the armature core, and applying to this extended part of the core an auxiliary field magnet, an independent regulation of the voltage is obtained; and if this auxiliary magnet is excited by the (continuous) current entering or leaving the machine it will automatically vary the voltage as the load rises or falls. A continuous-current converter of this type may be arranged as a balancer by having two identical windings and two commutators, the e.m.f. of which are then put in series, the negative brush from one side and the positive brush from the other being joined to the neutral wire of a three-wire distribution. A further possible arrangement is to have at the motor side a high-voltage winding, with its appropriate commutator and at the generator side two independent low-voltage windings, each with its own commutator, these two secondary windings generating equal e.m.f's. to supply the two sides of a three-wire distribution. One can imagine also a balancer for a five-wire distribution by providing the armature with four independent (equal) windings each with its own commutator, the four windings being put in series by connections at the brushes. If in a machine of this type any alternating-current winding designed in accordance with the number of poles, and connected down to the appropriate number of slip-rings for monophase, diphase, or triphase working, be wound on the armature, that side of the armature will serve for either synchronous motor or synchronous generator. If both windings are of this description this type may be used as a phase changer, but not as frequency changer. With one such alternate-current winding, combined with a continuous-current winding the machine acts as a synchronous converter.

6. **Converters (also called Rotary Converters).** In this type there is but one field-magnet system, excited in shunt (from the continuous-current side), or independently, or compound-wound, and but one armature winding. This winding is connected at one side to an ordinary commutator, but is also connected, at the other side, at points symmetrically chosen, with respect to the windings and to the number of pole-pairs, to an appropriate number of slip-rings. The advantages and limitations of this type are very well known. The machine runs only as a synchronous machine. It is not self-starting from the alternating-current side. Except by special provision mentioned hereafter it does not permit of independent regulation of the voltage, the voltage between the brushes on the continuous-current side being practically in a fixed ratio to that between the slip-rings on the alternating side. Though such a machine can be used to convert from alternating current (of one, two, or more phases) to continuous current, or vice versa, it cannot of itself fulfill the condition of solving the dominant problem of changing from high voltage to low; therefore in all such cases step-down transformers are needed to reduce the voltage. Owing to there being but one armature winding, the sources of loss of energy are reduced, particularly if the number of phases by which the currents are introduced on the alternating side is great. Converters with six slip-rings wound for six-phase current are more efficient than those with but three; and it is easy to arrange the windings on the three-phase step-down transformer so that it yields six-phase current on its secondary side. The efficiency of transformers is so high that the total losses for transformer and rotary converter are less than those of a motor-generator set of equal output.

A long controversy has raged between the advocates of converters and those of motor-generators. All sorts of disadvantages have been attributed to converters; not only was their voltage fixed so that regulation was difficult, but when running in parallel they were apt to "hunt;" they were apt to reverse polarity; they were—at least unless designed for very low frequency, and with consequent wide pole-pitch—apt to flash over at the commutator. All these defects have been successfully combatted. Converters working at frequencies of 50 or even 60 cycles per second can be designed to give satisfaction, though undoubtedly frequencies of 33 or 25 are preferable. The addition of an amortisseur in the poles has eliminated "hunting." The problem of regulating the voltage has found several solutions. By using transformers having considerable self-induction in their secondary circuits, or by introducing into their secondary circuits between the transformer and the converter appropriate self-induction coils, it has been possible to regulate the voltage on the continuous-current side by merely varying the excitation of the field-

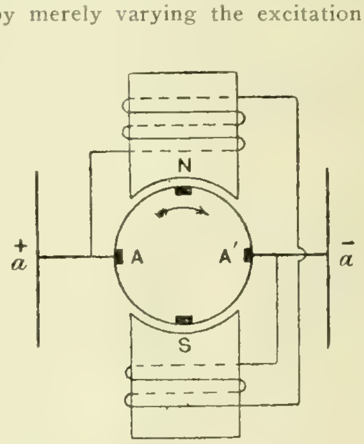


Fig. 1.

magnet; increasing the excitation raises the voltage on the continuous side, and while it necessarily also raises the alternating voltage of reaction, it tends to put forward the phase angle and counteract the drop in the power factor due to the self-induction of the transformer. A second method of regulation is to add a synchronous booster on the shaft of the converter, the voltage of the incoming alternating current being increased as the continuous-current output increases. A third method is to design the polar parts of the field-magnet so as to alter the wave-form of the alternating e.m.f. induced by the armature. The devices of Woodbridge for surrounding portions of each pole by coils for increasing or diminishing the magnetic flux in the pole-tips as compared with the flux in the central part of the pole afford a tolerable though not an automatic means of regulation. In a modification due to Burnham each pole is divided into two parts, the excitations of which can be independently controlled. A fourth method due to Miles Walker is to design the field magnet of the converter to give

a carefully graduated commutation zone, so that the voltage may be regulated by varying the lead given to the brushes.

Modern opinion seems to favor the use of converters in lieu of motor-generator sets, and the objections to them appear to have been largely overcome. They are occasionally designed with vertical shafts to economize space. Two rotary converters united together at their continuous-current sides might work as a frequency-changer, due regard being had to the number of poles and the voltages.

7. **Cascade Converters.**—In these machines the two parts consist of an induction motor and a continuous-current generator inter-connected electrically as well as mechanically. The motor part is an induction motor, into the stator of which the high-voltage three-phase current is brought. The rotor is on the same shaft as the armature of a continuous-current generator, and is connected to that armature electrically, the armature windings being connected back symmetrically to the windings of the rotor precisely as the armature windings are connected back to the slip-rings in a rotary converter. As a result the rotor runs synchronously, with a constant slip of 50 per cent., and half the power is transmitted electrically direct through the armature to the brushes, while the other half of the power drives the armature mechanically and generates the remaining half of the output delivered to the brushes. The efficiency of the machine is high, in general rivalling that of the combined rotary converter and transformer, and surpassing that of the simple motor-generator set of equal output. So much has been written upon the cascade converter by Arnold, Bragstad, La Cour and Hallo that no extended notice is here necessary. Cascade converters are now usually built as 12-phase machines in the rotor part, and with commutating poles on the field magnet. They also can be built with an alternating booster between rotor and armature for procuring independent voltage regulation.

8. **Revolving Field Converters.**—A curious type of machine is one in which the motor part resembles an ordinary alternator, the stator of which being, however, provided with two windings. One of these, an ordinary stator winding, receives the incoming high-voltage currents. The other winding, in the same slots, is an ordinary drum winding for the same number of poles, connected down to a commutator, which is stationary. The brushes revolve synchronously (pressing against the inside surface of the commutator), being carried round by the revolving field magnet, which runs synchronously. The poles of the field magnet need not be wound, being magnetized by the stator currents. In this case the electric energy is transformed and converted electrically. As thus described the machine is Arnold's modification of an earlier and more complex apparatus of Hutin and Leblanc, in which not even the iron of the field magnet revolved. The "Permutatrice" of Rouge and Fayet is essentially the same contrivance, but in it the brushes revolve externally to a fixed commutator of ordinary construction. The "Permutator" of Sahulka is of the same type.

9. **Rectifiers.**—From such machines as the foregoing, in which synchronously revolving brushes receive the continuous current, it is but a step to the much older rectifiers, by which it was sought to procure a uni-directional current from a simple alternating one by merely passing it through a synchronously revolving commutator or reverser. The rectifying commutator used in Wilde's alternators and later in those of Zipernowsky was an early example. Still later came the rectifiers of Pollak for accumulator charging, and of Ferranti for arc lighting. But none of these were satisfactory for rectifying large currents, since in the first place there was difficulty about sparking, and in the second the currents so rectified were pulsatory in character and not really continuous. Heyland's commutator for making a three-phase generator self-exciting belongs to the class of rectifiers, as the brushes on the commutator reverse the alternating currents synchronously without being provided with a magnetic field to procure sparkless commutation.

10. **Frequency Changers.**—Various combinations are possible. Two synchronous alternators with appropriate numbers of poles, coupled on one shaft, would form a motor-generator set suitable for this purpose. Steinmetz has suggested the combination of a synchronous and an asynchronous machine, but the latter cannot be used as the generator unless the system it supplies has other synchronous machines upon it to fix the frequency. The case of a pair

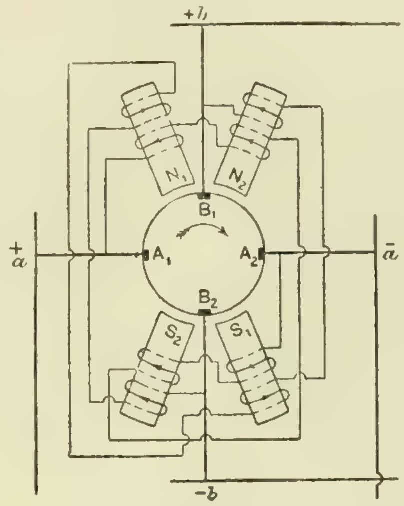


Fig. 2.

of coupled rotary converters has already been mentioned; and a pair of cascade converters might also serve the same object. A more hopeful suggestion is to couple mechanically the rotors of a pair of ordinary induction motors of appropriate voltages and numbers of poles, the combined machine running at such a speed as to be below synchronism for the motor machine and above synchronism for the generator machine. Such a combination would serve for interconnection of the networks of two generating stations.

11. **Phase Shifters.**—For the infrequent purpose of changing or shifting the phase of an alternating current, machines are occasionally needed, and the principle of them is simple. Consider an ordinary induction motor. The currents coming into the stator there conspire to produce a progressive or rotary magnetic field. If a coil be wound on the stator through two slots which are a pole-pitch apart there will be induced in that coil an alternating e.m.f. of the same period; but the phase of this e.m.f. will depend on the position of the slots with respect to the rest of the windings. If two such coils are wound in different positions the phase difference between their respective e.m.f.'s will depend solely on the angle by which their positions differ. Hence one could easily wind a stator with two sets of windings, a primary or motor winding and a secondary or generator winding, the latter giving out alternating currents of the same frequency, but of different phase angle, or even with a different number of phases from that of the primary current. Thus a machine may be constructed to convert three-phase current into two-phase or single-phase, or to convert single-phase into two-phase or three-phase. Such phase transformers were suggested independently by the author and by Arno. Another method is to couple together the revolving field magnets

of a pair of ordinary synchronous alternators, one to serve as motor the other as generator. By shifting the stator of either machine through the appropriate angle any desired phase difference between their respective e.m.f.'s can be obtained. Such a combination has been used to shift the load of a network from one generating station to another.

12. **Auto-Converters.**—The next recent type of converting machine is the auto-converter (also called the split-pole converter), the chief characteristic of which is the construction of the field-magnet with twice as many polar projections as there are poles in the winding of the armature, these magnet poles being arranged in pairs of the same polarity. As these machines seem destined to have an important future, some extended notice of them is desirable.

Consider Fig. 1 a two-pole armature with its ordinary windings and commutator. The windings span approximately across a diameter, and the two brushes stand at opposite ends of a diameter. There are two pole-pitches or regions, one usually occupied by the north pole, the other by the south pole of the magnet system. If the brushes are placed in the usual positions for collecting current (neutral points), the difference of potential between them (on open circuit) is then a maximum. If shifted through half a pole-pitch, that is, through a right angle, the difference of potential between them is reduced to zero. By adopting the modern method of compensating windings, current can be collected sparklessly, without giving the brushes any lead.

Suppose now we divide each of the poles of the field-magnet into two, so that the north pole N is replaced by the two poles N_1 and N_2, and that the south pole S is replaced by the two poles S_1 and S_2, as in Fig. 2. The pair N_1, S_1 may be considered as belonging to one magnetic circuit, the pair N_2, S_2 as belonging to a second and independent magnetic circuit at right angles to the first. If the first pair only is excited, the voltage between the brushes A_1, A_2 will be that due to N_1, S_1; if the second pair only is excited the voltage between the brushes A_1, A_2 will be that due to N_2, S_2. If both pairs are excited, the voltage between the brushes A_1, A_2 will be that due to the whole flux from N_1 and N_2, through the armature, to S_1 and S_2. Now suppose a second set of brushes B_1, B_2 placed in a position at right angles to A_1 and A_2. It is obvious that if both pairs of poles are excited the voltage between these two will be that due to the difference between the two fluxes of the magnetic circuits. It we call the two fluxes F_1 and F_2 respectively, the voltage across A_1, A_2 will be proportional to $F_1 + F_2$ and that across B_1, B_2 to $F_1 - F_2$. (If we consider the partial voltages across from A_1 to B_1 and from B_1 to A_2, these will respectively be proportional to F_1 and F_2). If now exciting coils are wound on these poles such that F_1 is made proportional to the sum of the A and B voltages, and that F_2 is made proportionate to the differences of the A and B voltages as can be effected by shunt coils which are wound summationally on the pair N_1, S_1 and differentially on the pair N_2, S_2, then the generated A voltage which is proportional to $F_1 + F_2$ will depend on the A excitation only, and the generated B voltage which is proportional to $F_1 - F_2$ will depend on the B excitation only; in other words each half of the machine will act as an independent self-excited shunt-wound machine. Each may, of course, be also compound wound, or might even be merely series-wound following an analogous plan. Fig. 3 depicts the combination arranged as a four-pole machine; but in reality it consists of a single armature acted upon by two independent two-pole field-magnets. The single machine so arranged becomes, therefore, the equivalent of two independent machines coupled together. So far, we have described it as a double generator, but obviously it can be used as a continuous current converter. The term "auto-converter" is more descriptive seeing that there is only one armature winding. If a continuous current is applied to the brushes A_1, A_2 it will run as a motor, and an independent continuous-current will be generated in it, and delivered at the brushes B_1, B_2. If the pole-sections and windings are alike, the fluxes will be equal and the voltages equal. They can be made unequal by altering the pole sections or reluctances of the magnetic circuits, or the resistances of the exciting circuits, or by shifting the brushes to intermediate angles. With appropriate modifications such a machine can be used as balancer, or booster, or as a three-wire generator.

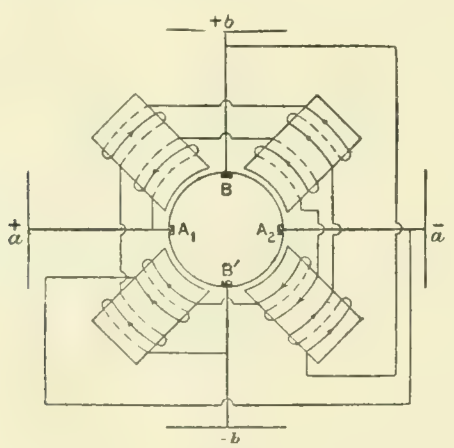


Fig. 3.

If instead of adopting the method of excitation described above, one of the magnet pairs N_1, S_1 is independently excited and the second magnet pair N_2, S_2 is excited from the brushes pertaining to the field of the first pair, the machine then becomes a variable-speed generator and will furnish an approximately constant voltage at any speed, in either direction of rotation, as required for train lighting.

Now suppose the same armature to be connected at the appropriate symmetrical points to three slip-rings. The same machine will then be capable of being used as an alternating-continuous converter, and could furnish two different continuous currents at the same time, at equal or different voltages. It must, of course, run synchronously.

In the foregoing it has been assumed that armature reaction is absent or has been compensated. If instead of compensating armature reaction it is enhanced by short-circuiting one pair of brushes, fresh developments are possible; and on this procedure have been based a number of interesting machines such as: the train-lighting generators of Roenberg, Midgeley and others, and Woodbridge's exciter for three-phase systems. Of auto-converters that of Crompton-Macfarlane-Burge has obtained wide application. Considered in its bipolar form the generator e.m.f. is tapped off at the commutator between one of the A_1, A_2 brushes of the motor circuit and a pair of connected B brushes situated at equipotential points, not necessarily on a diameter at right angles to A_1, A_2. To make these B points equi-distant from the A brush as well as equi-potential, the two divided pairs are arranged in bilateral symmetry with respect to the A_1, A_2 axis, N_1 being the same size as S_2 and N_2 as S_1.

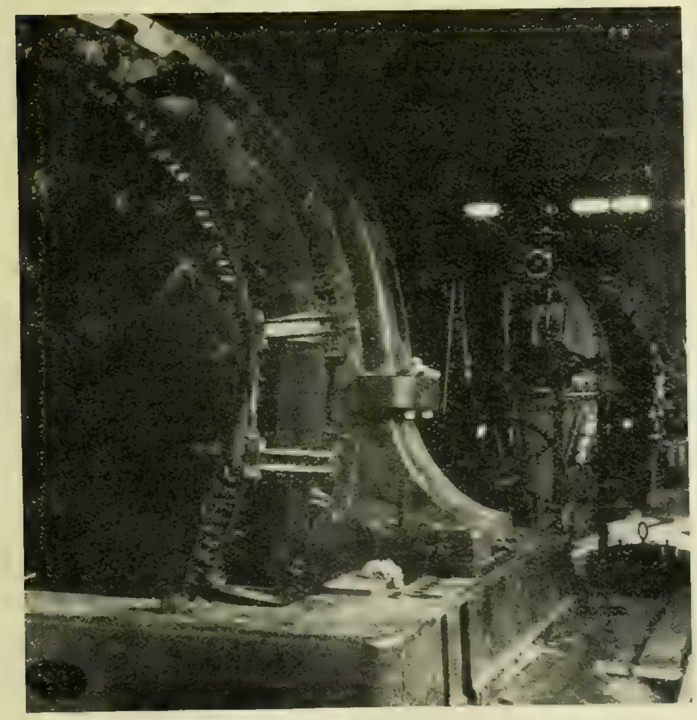
These machines are being used (1) as step-down continuous-current converters; (2) as voltage regulators; (3) as converters to convert from variable current at constant voltage to constant current within a limited range; (4) as rotary converters affording regulation of the continuous voltage without affecting the power-factor on the alternating side.

Porcupine Power Company's Plant

Timber Dam, 700 ft. Wooden Flume, 10 ft. diam. Steel Penstocks, Three 1,500 h. p. Generators—To Supply Porcupine District

The accompanying photographs show phases of the construction of what is probably Ontario's most northerly hydro-electric plant. It is situated on the Mattagami River, at Sandy Falls, 500 miles north of Toronto, 45 miles from Kelso the nearest railway station at the time of its construction, and 6 miles from the Hollinger mine in the Porcupine district in connection with the development of which this power plant was built.

Construction work was carried on with record rapidity commencing on January 20th of the present year when the road was being cut through to the power site, and being completed on May 30th when two 1,500 h.p. turbines were ready for operation. In the meantime a temporary power plant had been installed, and a sawmill built and placed in operation to supply the necessary material for the construction of the power house, crib-work of the dam,



Two 1,500 h.p. Generators—Porcupine

&c. This temporary power plant is the one that was destroyed by fire during the early summer. The sawmill was also destroyed almost before it had served the purpose for which it was constructed. In spite of these drawbacks however, and with the snow 5 feet deep on the average and the temperature down to 43° below zero, the power plant was completed on schedule time, and was delivering power to the Hollinger mine, on the 1st of June.

The minimum natural flow of the Mattagami River at this point is 1,400 feet per second, and the maximum observed flow 15,000 feet per second. By the construction of a timber crib rock filled dam, 1,000 feet long, and with a maximum depth of 25 feet, a storage pond 30 miles long has been created varying in width from 100 to 400 yards. The dam has 10 openings, 16 ft. x 18 ft., and the cribs are provided with a half-inch steel corner protection, which are also used as stop-log guides. These stop-logs are forced into place by hydraulic jacks which are movable by cribs, and are held in place at the upstream end of the dam by the pressure of the water. An effective head of 34 feet is obtained.

The flume which conducts the water from the dam to

General Lay-out—Porcupine Plant

the power house is 700 feet long, timber construction as shown in the photograph, and lined with 2-inch matched red pine. A sheeting of 1-inch matched pine also covers the outside, leaving a 4-inch intervening air space. This air space will be electrically heated during the winter. The internal dimensions of the flume varying from 16 ft. x 13 ft. to 16 ft. x 23 ft.

The penstocks are of steel. 3/8-inch material, 33 feet long, 10 foot diameter. There are two penstocks of this

Power House Exterior—Porcupine

size, one each operating a 1,500 h.p. generator. The flutter gates, S. Morgan Smith manufacture, are also 10 feet in diameter, and are operated by electric motors.

The two turbines are 43 inch S. Morgan Smith manufacture. Each is rated at 1,700 h.p. under an effective head

of 34 feet. These are direct connected to two 1,500 h.p., 25-cycle, 3-phase, 12,500 volt, 214 r.p.m. Canadian Westinghouse alternating generators. There are also two exciters, one each on the shaft of the main generator.

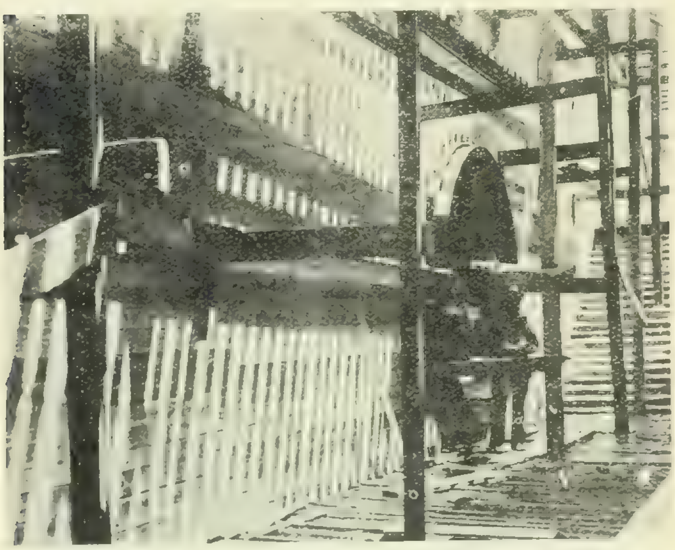
The water leaves the turbines through draft tubes formed in the solid rock, and concrete lined. The discharge point is two feet below the surface of the river. The maximum dimensions of the draft tube are 14 ft. 6. in. x 8 ft. 6 in.

The power house is a timber frame structure galvanized iron sheeting. The foundations are concrete, set on the solid rock. Size of power house is 132 ft. x 38 ft. The building is equipped with a three motor, 15 ton travelling crane of the Advance Machine Company's manufacture.

The transmission line is in duplicate, and is carried on 35 foot poles having a 10 inch diameter at the small end. Transmission is by 3-phase circuits of No. 0000 aluminum wire. Many of the poles are set in the solid rock but those not so set are guyed. A right-of-way, cleared of all timber 66 feet on each side of the line, protects it from fire or falling trees.

Already the capacity of the two units installed is overtaxed, and foundations have been prepared and the building is now being extended for the installation of a third similar unit, namely, of 1,500 h.p. capacity. This apparatus will not be taken in until winter, when transportation facilities are better, but will then be installed at once.

This plant was designed and constructed for the Porcupine Power Company, by H. D. Symmes, engineer and contractor of Niagara Falls, Canada, who is also a director of the company. The president of this company is Mr. John McMartin. It is said that during the whole of the

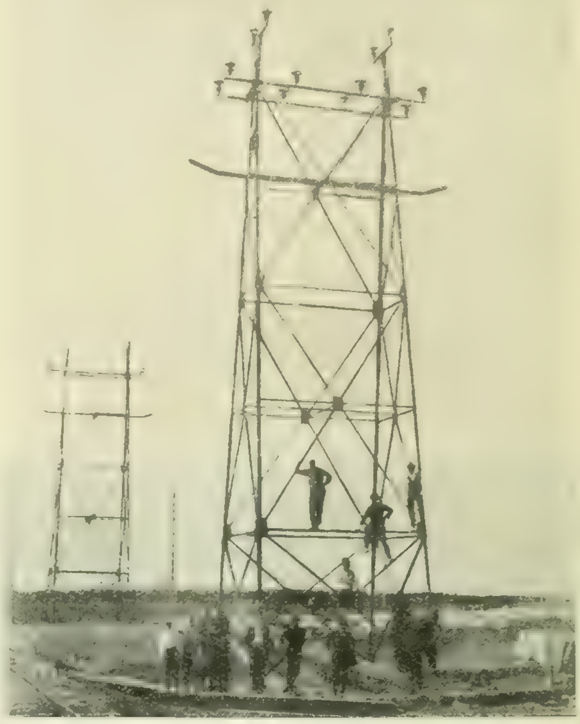


Interior Flume with Penstock - Porcupine

construction work on this plant there was no sickness whatever in the camp, which speaks well not only for the natural healthiness of our northern climate, but also for the care exercised by the engineers in keeping the camp in a perfectly sanitary condition.

A New Record for Tower Erection

When an operating company has to do any work on a high tension line it has to do it quick and the following is a good example of that kind of work. It was necessary to erect two special railway crossing towers over the new Transcontinental Railway where the 60,000 volt transmission lines of the Winnipeg Electric Railway cross the railroad track about five miles east of Winnipeg. It was necessary to do this work with the least possible interruption to service. The wet marshy ground made the work particularly difficult. The towers which were sixty feet high and weighed six tons each were supplied by the Vulcan



60 ft. Railway Crossing Towers

Iron Works and were assembled on blocking opposite their respective footings which were of concrete. The time chosen for the erection was five o'clock Sunday morning. The load was then transferred from the water power plant at Lac du Bonnet to the Company's auxiliary steam plant in the city, and in one hour and forty-two minutes from the time the transmission line was dead, the towers were up and ready for the power to be switched on again. This included raising the two towers, which was done with tackle over shear legs with a locomotive for motive power, placing insulators on the towers and tieing in the lines. Mr. C. R. Ross was in charge of the erection and had a gang of eight men on the work. The accompanying photo shows the towers after erection.

Toronto Section A. I. E. E.

The first meeting of the Toronto Section for the season 1911-12 was held on October 6th at the rooms of the Engineers' Club, Toronto. There was a total attendance of twenty-five members, students and visitors. The officers for the ensuing year were elected as follows: A. L. Mudge, chairman; F. A. Gaby, vice-chairman; J. G. Jackson, P. H. Kemble, D. H. McDougall; V. Boyd, secretary.

Following the election of officers a vote of thanks was moved to Mr. W. H. Eisenbeis, who has been secretary of the local section for several years and now has moved to Pittsburg. Mr. E. Richards gave a very interesting account of the Chicago convention. A very interesting lantern slide talk was also given by Mr. Parker H. Kemble on the construction of the Fourth Avenue sub-way, Brooklyn. The meeting though smaller than usual was enthusiastic and the outlook for the coming year is very promising.

Lethbridge Municipal Power Station

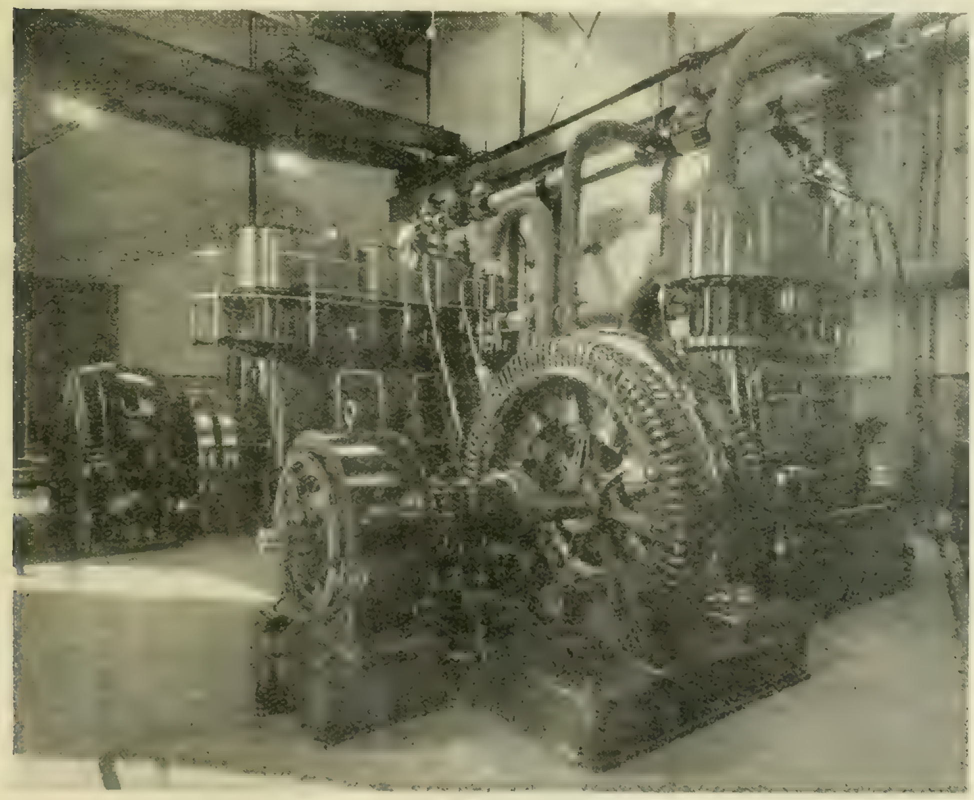
Great Progress in the West—A Modern Steam Plant - Pumping Equipment Electrically Driven — City operates own Coal Mine

The city of Lethbridge, Alberta, is a divisional point on the Crow's Nest branch of the Canadian Pacific Railway, has a population of about 15,000, is the centre of one of the principal coal mining areas in the west and is surrounded by an agricultural district which is considered second to none. Also, it is a shining example of the successful municipal ownership of public utilities, and in this connection the following particulars will be of further interest.

The inception of the Municipal Electric Power Station dates back to May, 1908, when Messrs, Smith, Kerry & Chace were called in by the city council to value the then existing electric power undertaking owned by the Lethbridge Electric Company. This company was giving a general light and power service and also supplying electric power for operating the municipal waterworks pumping station.

The city, after completing the purchase of the Lethbridge Electric Company's undertaking, retained Messrs. Smith, Kerry & Chace to design a new plant and equipment for electric power and for waterworks pumping, that should be capable of ready extension to supply a city of 30,000 population, and also to remodel and extend the existing system of waterworks distribution.

The city of Lethbridge is in the prairie country and adjacent to Belly River, from which the town water supply is taken. The river is in a deep ravine and at low



Generators, Piping and Crane—Lethbridge Power Station

water its elevation is about 300 feet below the highest elevation in the city. The municipal pumping station referred to above is situated close to the river and contains modern equipment, though it is no longer fully equal to the city's requirements. The plant consists of two centri-

Lethbridge Generating Station, showing Outgoing Feeders

fugal pumps each driven by a 150 h.p., 2-phase motor, and two 50 h.p. electrically driven centrifugal pumps, the latter being for the purpose of supplying the additional pressure required for fire purposes. This plant was manufactured and installed by the Allis-Chalmers-Bullock Co. in 1905.

For the sake of access to coal and water the new power station was built alongside this pumping station, which is still used as a reserve plant, thus giving the additional benefit of operating both plants with one staff. The river provides ample condensing water under all conditions for the steam power station. The city operate their own coal mine within a few hundred yards of the power station. The coal is a fair quality of bituminous coal showing by analysis of a selected sample a heating value of 12,366 B.t.u., but the "run of the mine" contains a large proportion of shale, etc. It is conveyed from the mine on a small tramway and dumped direct into the coal crusher of the elevator at a cost of less than $2 per ton.

Tenders were advertised for in January, 1909, covering a steam electric power plant of the most modern description and designed for the highest economy of operation, especially with respect to coal and labor. The buildings were designed to allow of large additions to the electric

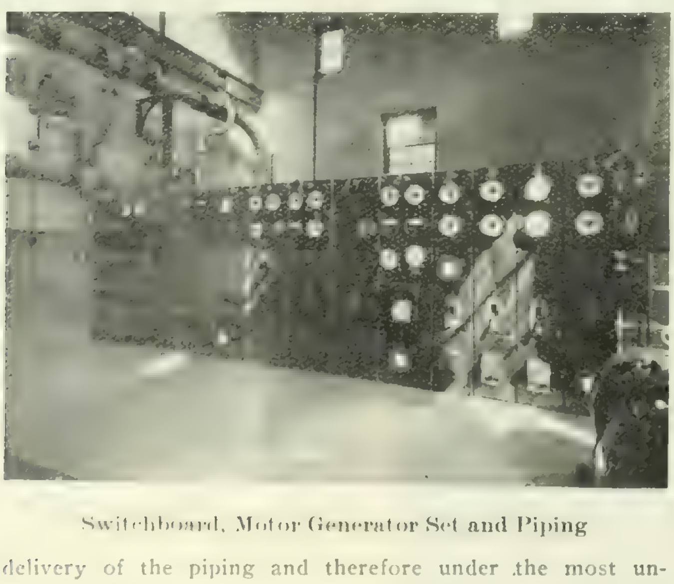
plant and also to contain a steam pumping engine which was added later.

The original plans contemplated removing the best items of the plant in the old power station to the new power station, but owing to a fire which completely destroyed the old station on December 31st, 1909, extensive alterations had to be made to both the plant and buildings and very considerable delay in completion was caused thereby. It is interesting to note in this connection that one of the main reasons advanced by the consulting engineers for the immediate installation of a municipal plant was the grave risk of the destruction of the old power plant by fire and the consequent cutting off of the supply of both water and light to the city. When the fire occurred the new plant was nearly, though not quite, ready for operation, but the Alberta Railway & Irrigation Company had recently completed an extensive new electric power plant at their coal mines and came to the assistance of the city until the first unit in the new power house was in operation. This first unit took the load regularly from January 17th, anticipating the contract date by ten days and reflecting much credit on the contractors, Messrs. Laurie & Lamb and the Canadian Westinghouse Company.

A detailed description of the plant is given below. Briefly summed up it consists of one 350 and one 588 kw., 2-phase, 2200 volt generator driven by high speed vertical condensing engines, water tube boilers with chain grate stokers, superheaters and economizers, and a coal conveying and storage plant. The results secured are the best proof of the suitability of the layout to meet the local conditions.

The old power station, when taken over by the city, was put in as good condition as possible and operated for one year (1909) with "breeze" coal at 50 cents per ton. The result was a loss of $2,768, without allowing for depreciation. The fire caused a sudden and complete change over to the new station.

The new power station during the first complete year's run (1910) was operated non-condensing owing to delay in

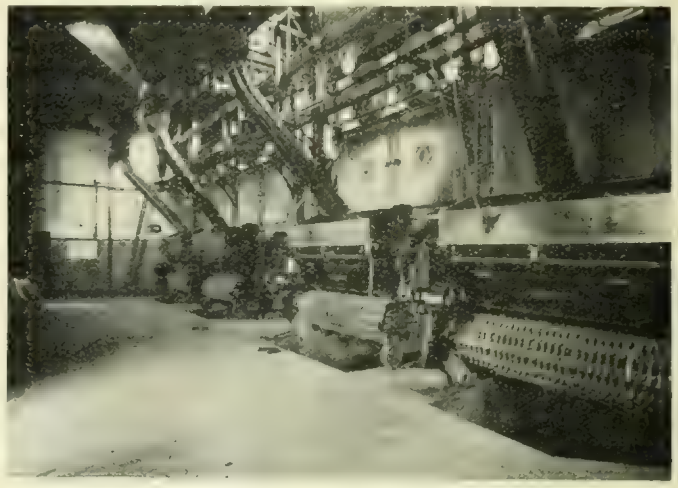


Switchboard, Motor Generator Set and Piping

delivery of the piping and therefore under the most unfavorable conditions as to coal consumption, boiler feed water, etc. The coal used was "run of the mine" as above described, and costing under $2 per ton. The charge for electric light and power remained the same as the previous year.

The city's financial statement shows that the result of this first year's operation of the new power house was a balance of $30,864 after deducting all costs and meeting interest and sinking fund. If we allow a further five per cent for depreciation on the whole of the capital outlay for buildings, plant and distribution system there is still left a sum of over $19,000 as clear net profit. Compared with the previous year's operation of the old works, the power house wages were reduced by 26 per cent., expenditure on coal by 49 per cent., and the total power house costs were reduced by over 37 per cent., although they represented an output 40 per cent. greater.

Credit for these successful results must certainly be also given to the organization and management of the city's



Fronts of Boilers—Lethbridge

superintendent electrical engineer, Mr. Arthur Reid.

As a result of the above profitable operation the price of electric light was reduced from 14 cents to a sliding scale ranging from 11 to 9 cents, power to 4 cents per kw.h. and for motors of 50 h.p. and over to $28 per h.p. year (all subject to ten per cent. discount), a figure which compares favorably with the best prices for water power in the West. Even on these reduced prices the undertaking shows a balance for the first six months of 1911 of $8,414, after deducting interest and sinking fund; and, allowing five per cent. depreciation as before, a clear net profit of about $2,740.

The electrical output generated during the first half of the year was 692,000 kw.h., and the water pumped amounted to 164 million gallons, an average of about 900,000 gallons per day, though at times the demand exceeds 1,500,000.

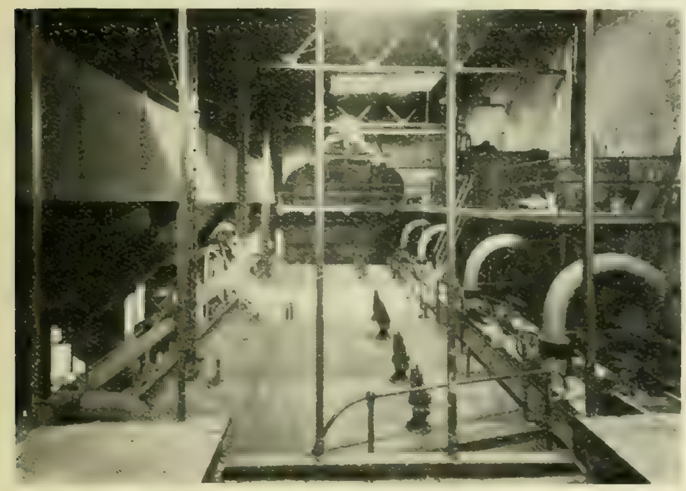
Such results can only be obtained from the highest class of plant giving maximum efficiency with minimum cost of attendance and repairs, and specially designed and laid out to suit the local conditions; all plant in this case was subjected to rigid inspection during manufacture and performance tests before shipment.

The total capacity of the plant now installed is, including the equivalent of the waterworks steam pump, about 1,080 kw. or 1,640 h.p. This pump is of 2,000,000 gallons per day capacity and it is installed in the same engine room as the electrical generators and supplied with steam from the same boilers. The old pumping station is right against the new power house so that the whole plant is practically under one roof. The new engine room has space to add a further 1,000 to 1,500 kw. of generating plant and the boiler house plant, coal and ash conveyor, etc., have all been specially designed to give facility for extensions on the same lines as the present installation. Plans are now being drawn for adding about another 1,000 kw. and doubling the capacity of the boiler house.

The principal items of the plant installed are as follows:

Boilers.—Four Babcock & Wilcox water tube, 150 lbs. pressure, 2,823 feet heating surface, 8,600 lbs. evaporative capacity each, fitted with chain grate stokers provided with both motor and steam drive (alternatives) and superheaters of 490 square feet heating surface each to give 130 degrees F. superheat. Galleries are provided along the front and top of the boilers.

Coal and Ash Plant.—The conveyor is Messrs. Babcock & Wilcox's Standard Silent Gravity Bucket Conveyor and handles both coal and ashes. The capacity for coal is ten



Bunkers, Fan Engines, Water Purifier and Piping

tons per hour and the coal is automatically dumped into bunkers above the boilers of 200 tons capacity—from these bunkers it feeds by gravity into the stoker hoppers. The coal as received from the mine is first dumped into an electrically driven coal crusher which feeds the electrically driven conveyor automatically. The same conveyor handles the ashes when not delivering coal, the ashes being emptied into the conveyor buckets from the ash pit and chute by means of an automatic filler which exactly fills each bucket without spilling; the ashes are then conveyed into an elevated hopper placed over the tramway track from the mine and carried away to the dump in the same cars that deliver the coal. A trench 6 feet square runs the whole length of the boiler battery and gives facility of access to the ash handling plant.

In laying out the boiler house and plant the probability of early extensions was provided for by designing and locating the bunkers so that they will feed a second battery of boilers placed opposite to the first, and by designing the conveyor so that it will also handle the coal and ashes from this second battery.

Economizer.—This is of the Sturtevant Company's standard make with electrically driven scraper gear, and was supplied by the Polson Iron Works, Limited, of Toronto.

Mechanical Draft.—Induced draft is relied upon entirely on account of the proximity of high hills and the apparatus is installed in duplicate. There are two fans driven by high speed vertical engines; each set will give its maximum efficiency when dealing with 750 boiler h.p., but is capable of easily dealing with 1,000 boiler h.p. Steam drive was chosen as giving great facility and reliability of speed regulation by automatic control of the admission of steam to the fan engines—the steam pressure at the boilers is automatically held within less than one per cent. of normal.

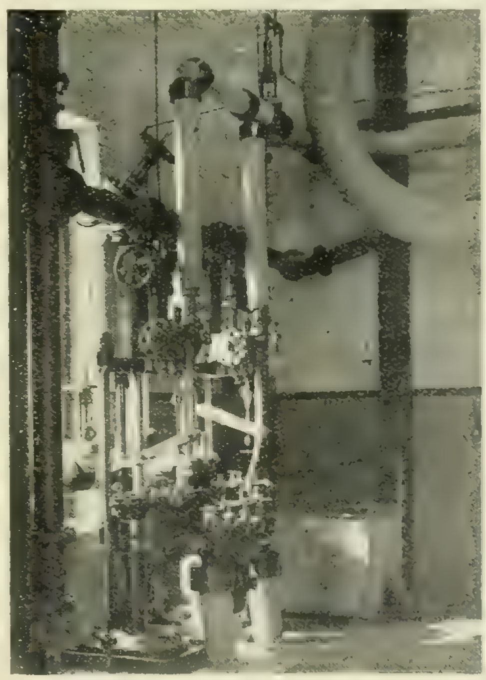
Boiler Feed Pumps.—There are two "Weir" vertical pumps, 7 in. x 9½ in. x 21 in. supplied by Peacock Bros., of Montreal. Capacity 4,000 Imperial gallons per hour each. These deliver through a feed water heater (using the steam from the auxiliaries) to the economizer.

Water Purifying Plant.—All boiler feed water, whether raw water make up, hot well or hot water drainage, is delivered to a combined water softening and de-oiling plant of Lassen & Hjort type supplied by Messrs. Babcock & Wilcox. After treatment it is delivered by gravity to a treated water storage tank of large capacity. Alternatively, in case of the water purifier being out of service, water can be drawn by the feed pumps direct from a smaller raw water tank fed continuously by the town water service.

Generating Sets.—One 350 kw. 2,200 volt, 60 cycle, 2-phase generator with direct connected exciter, direct coupled to a 440 B. h. p. high speed vertical compound condensing engine. One 588 kw. similar generator with direct connected exciter. and direct coupled to a 720 B. h. p. high speed vertical triple expansion condensing engine. The Canadian Westinghouse supplied both generators, as also the switchboard and a 30 kw. motor generator for alternative excitation. Both the engines, and also two separate motor driven condensing sets were manufactured by Belliss & Morcom, of Birmingham, England, and supplied and erected by Laurie & Lamb, of Montreal.

Piping.—The whole of the piping and valves was supplied by Messrs. Stewart & Lloyd of Glasgow, through Messrs. Drummond & McCall, of Montreal. The piping being one of the most important parts of a steam plant particular care was taken to secure the utmost reliability with the maximum of convenience.

The ring principle in a very compact form is used for the main steam pipe, enabling any engine to be fed from any boiler. All high pressure pipes are of lap-welded steel with a tensile strength of not less than 24 tons nor more



Feed Pumps and Lea Recorder in corner

than 29 tons per square inch and an elongation of not less than 33 per cent. in a length of 2 inches. The flanges are of wrought steel, screwed on, the tube ends being also expanded into the flange and rivetted up on face. The flanges were faced and turned on edge after being fixed on the pipes. Crosses and tees are of cast steel. All high pressure piping was tested up to 300 lbs. per square inch. High pressure piping of all sizes even down to the drains is

flanged, to secure tight joints and ready repairs. All steam and hot water piping is covered with 2 inches of the best fibrous asbestos canvassed and painted and with flanges fitted with removable covers of the same material encased in sheet metal. Exhaust and low pressure water piping is of heavy flanged cast iron. The whole is supported on brackets and suspension loops of the most substantial character.

Waterworks Pump.—This is a Worthington duplex triple expansion, horizontal, condensing, high duty pump engine of 2,000,000 Imperial gallons per 24 hours capacity, supplied by the John McDougall Company, Limited, of Montreal. Very careful tests were made of this plant under working conditions which showed a duty of over 123,000,000 foot pounds per 1,000 lbs. of steam, which was better than the guarantee.

Belliss & Morcom Engines.—The result of the steam consumption tests on these British made high speed vertical engines are of interest. The tests were carried out at the makers' works under the superintendence of the British Boiler & Insurance Company's experts on behalf of Messrs. Smith, Kerry & Chace. The load was furnished by a Heenan & Froude water brake and the figures given for full load are the average of three separate tests.

Steam pressure 150 lbs. Vacuum 26 in. Superheat 100 deg. F.

	Pounds of steam per B. h. p. hour. Percentage of load			
	125%	100%	75%	50%
400 B. h. p. Engine	15.15	14.53	14.45	14.9
720 B. h. p. Engine	13.10	12.79		

It may be noted that the result on the 720 h.p. engine at full load was over four per cent. better than the guarantee.

The preparation of the specifications and plans, and the erection of the plant and machinery were supervised for Messrs. Smith, Kerry & Chace by Mr. H. E. M. Kensit, Mem. A.I.E.E., who also drew up for the city a complete system of keeping records of the output, and costs of producing and distributing electric power.

Winnipeg's Model Isolated Electric Plant

The Steam Generating Station of the T. Eaton Co.—Capacity of 1600 Kw. in 6 Units—Efficient Fire Protection—115 Motors Operated

What might be regarded as a model isolated power plant, is the one which furnishes electrical energy and heat for the Winnipeg store of the T. Eaton Co., Limited.

This plant occupies a roomy two-storey building adjacent to the large department store, and has not the usual space restrictions, poor ventilation and lighting of the average power plant for like service. As will be noted from the accompanying illustrations, the building is attractive in appearance, and the smoke stack, which is over one hundred and ninety-eight feet high, has been exceeded in size only recently by the Winnipeg Electric Company's tall stack. Both were erected by the Canadian Kellogg Co.

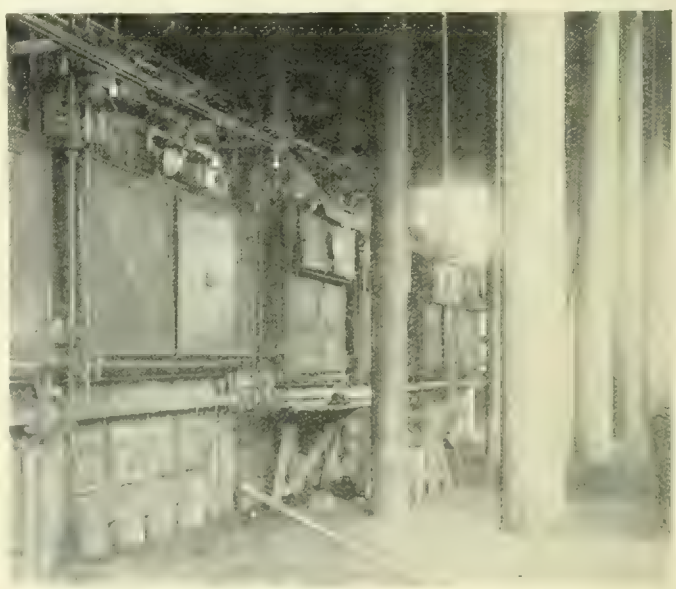
Boiler Room Equipment

This consists of seven boilers, of which one is a Robb Safety Water Tube boiler of 375 horse power capacity; two are Heine Safety Water Tube boilers of 425 horse power each; and four are Heine Safety Water Tube of 215 horse power each. A steam pressure of 140 pounds is carried, but all boilers and auxiliaries are piped with high pressure fittings good for 250 pounds. The boilers are fitted with Parson's Patent Furnaces with forced draught and consume approximately twenty-five tons of coal per day, for seven days per week. A mixture of three of anthracite screening to one of Pittsburg soft coal is used. As the plant is located in the center of the city it is necessary to haul the coal from the railway. Once at the building it is handled by the latest Jeffries Coal Conveying machinery. It is dumped from the wagons through a number of coal holes in the passage-way ground floor into a bunker of 112 tons capacity and is then fed through valves on to a fourteen inch belt conveyor running at a speed of two hundred feet per minute and has a capacity of twenty tons per hour. This conveyor mixes the coal in the three to one mixture above noted, and discharges it onto a bucket conveyor which elevates it to the large bunker on the second floor. This bunker has a capacity of two hundred and sixty-five tons, and discharges the coal to the boiler room floor through the tubes which may be noticed in the photo of the boiler room.

The ashes are elevated from the boilers by an ash conveyor to a bunker on a second floor. The bunker has a capacity of fifteen tons, and is provided with a chute to the outside of the building through which the ashes are discharged into the wagons. The coal conveyor is driven by a 7½ horse power, 220 volt direct current motor running 590 revolutions per minute, while the coal conveying machinery is driven by a 13 horse power, 220 volt, 1070 r.p.m. direct current motor.

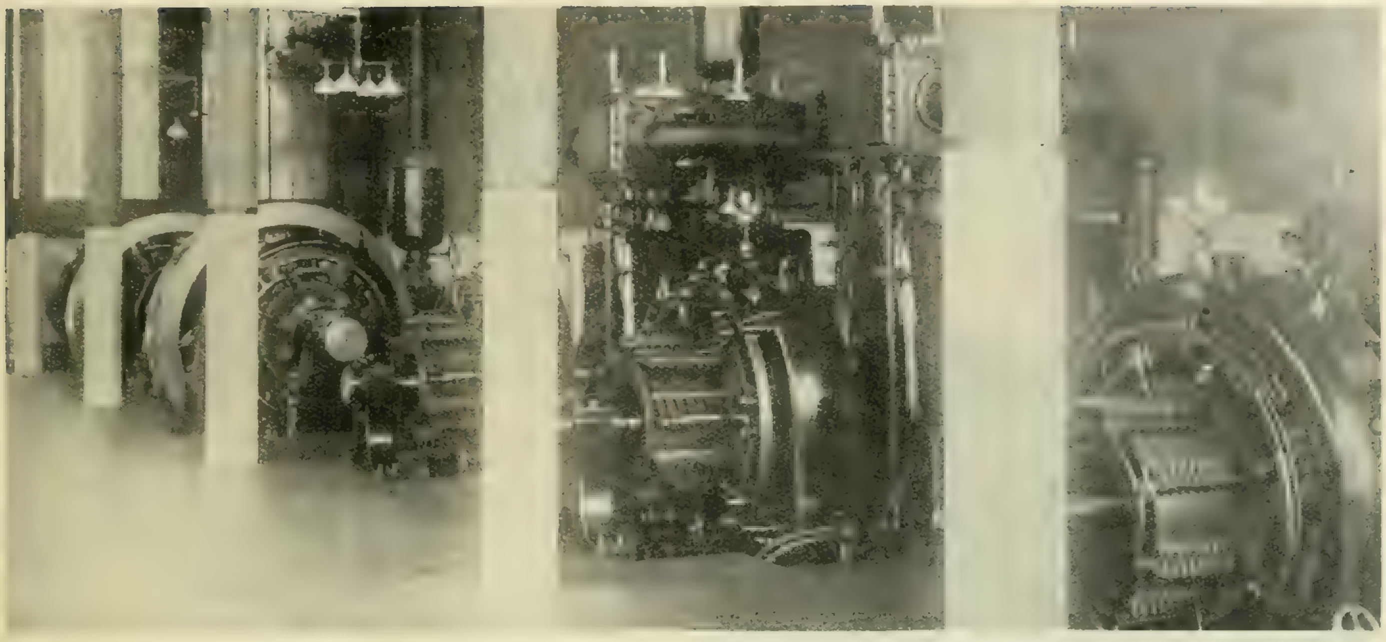
Engine Room

This is a particularly well lighted and attractive engine room, with tiled floors, a high tiled wainscoating, and



Boiler Room T. Eaton Co. Plant, Winnipeg

artistic and effective fixtures for lighting at night. The equipment comprises eight direct connected Robb engines six of which are vertical, and the others horizontal types. There are six Westinghouse and two Western Electric Company direct current 110 volt compound wound generators with a total normal capacity of about 1,600 kw. These machines are operated on an Edison three-wire system with



The T. Eaton Co. Plant, Winnipeg Engine Room, showing D.C. Generators

220 volts across the outside bus-bars. This voltage is used for motors, while the 110 volts is used for the lighting of the store, etc. For normal loads, four machines are required in the summer months and six in winter. Two machines are required for night, Sunday and holiday loads. The switchboard for the control of these machines consists of eight generator panels, one distributing panel for auxiliaries in the power plant, and a large panel for the steam gauges, fire alarm gongs, etc. The distributing switchboard for the plant is located in the basement of the store, and ten one million circular mil cables running through the tunnel between the two buildings tie this board in with the three bus bars on the generator board. The accompanying illustrations show clearly the arrangement of the generators and the front of the switchboard. In the corner behind the switchboard is situated the feed water heater for the boilers by which the temperature of the feed water is raised to 210° F. The low pressure exhaust steam furnishes the heat and the operation of the heater is particularly good. It also relieves the boilers of considerable deposit from the water for about one thousand pounds of mud is removed from the heater when it is cleaned every four weeks.

The distribution board comprises four slate panels 7 ft. 8 in. high by 24 in. wide. There are twenty-four three wire 110-220 volt circuits, four of which are 800 amperes capacity, four 600 amperes, and the remainder 400 amperes. Two circuits run to each floor of the store and lighting and power feeders are taken off the same circuits. All the wiring in the building is carried in conduits in the most up-to-date manner.

Pumping System

The plant and store are provided with a very complete and efficient pumping system, which should meet almost any emergency short of entire destruction of the building by earthquake or similar catastrophe. A large number of the pumps are electrically driven, and there are steam auxiliaries for emergencies. These pumps are located in the engine room basement and the store basement as described below.

In the store basement are a 10-in. and 6-in. artesian well from which water is lifted into an open tank by the air lift system. Air is supplied by an 8-in. x 8-in. motor driven air compressor. Seven 10-in. x 12-in. triplex single acting power pumps with a capacity of 480 gallons per min. each, pump this water into accumulators for the hydraulic elevator service. These pumps are driven by 220 volt d.c. motors with automatic starters controlled by contact gauges set with a range of 110-30 pounds. The above mentioned accumulators are also connected to the sprinkler headers for fire protection work. These headers are provided with check valves and are normally kept at a higher pressure than the accumulators. The breaking of the sprinklers reduces the pressure on the feeder affected, and allows the water from the accumulators to flow into the pipe, and at the same time rings a gong to notify the man on duty. There are also two 7 x 8 triplex motor driven pumps for the store water supply with automatic controllers for holding the pressure of the mains between 73 and 83 pounds.

There are also two 6 x 6 motor driven air compressors supplying air for the elevator gates and for the elevator accumulators, of which there are eleven in the pump room, four in the engine room and seven in various locations on the elevator mains. Two motor driven carbonating machines are required for the soda fountains, and a vacuum pump is also installed for cleaning several of the store departments. Two No. 7. Greene blowers driven by 5 h.p. motors furnish air at a 13 ounce vacuum for the pneumatic tube system. In connection with this it may be noted that there are 105 stations with a total length of tubes of about seven miles. There are eighty automatic cut-offs in use on tubes which shut air off those lines when there are no cartridges in the line. It may be interesting to note that before the adoption of these cut-offs, which are the invention of the T. Eaton Company's Winnipeg expert, both blowers were required to operate the tubes, while one blower is all that is required at present.

Power House and Tower

In the engine room basement are two reserve compound steam fire pumps with a capacity of 15,000 gallons

per minute each. The suction end of these pumps connects to an 18-inch main connecting the main storage tanks under the boiler room with all steam and electric fire and elevator pumps, and also elevator surge tanks. A low pressure alarm bell notifies the engineer when to start these pumps. The storage tanks have a capacity of 240,000 gallons and store 160,000 gallons normally leaving reserve capacity to handle a heavy rainfall. Three 6-in. city mains connect with this tank, one of which opens automatically. A centrifugal pump driven by a 10 h.p. 220 volt motor is used for emptying this tank. There is also an 8-in. x 8-in.

The T. Eaton Co. Plant, Winnipeg—Switchboards

Bury high speed air compressor driven from a 20 horse power motor used for pumping from the artesian wells. The drainage sump is emptied into the sewer by a motor driven centrifugal pump.

There is also an incinerator in the basement which burns all rubbish and sweepings from the store. The heat from this passes into the fire box under No. 7 boiler.

All told there are about 115 motors in operation in the store with uses varying from the heavy pumps above described to coffee grinders, mixing mills, etc., and every advantage is taken of the efficient application of electricity to department store uses.

Mr. R. Hupp as chief engineer for the store is in charge of this plant and other apparatus.

The Romapac Compound Rail

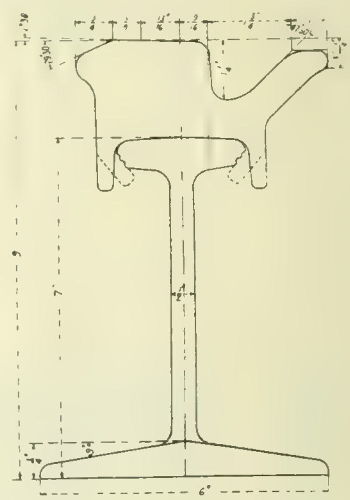
The Electric Railway Journal of Sept. 23 prints a short descriptive article on the Romapac Compound rail, now being tried out in Chicago. The article is in part as follows:

"The Board of Supervising Engineers of Chicago Traction has approved the installation of 4 miles of Romapac rail, which will be laid by the Chicago Railways Company and the Chicago City Railway. This type of rail is being introduced into this country by Walter Del Mar, of London, England, who represents the English interests controlling the patents. An American company, known as the Continuous Rail Company, of New York, with offices at 17 Battery Place, New York, has been formed to promote the use of the rail in this country.

The Romapac rail is designed to effect a considerable saving in renewals. It consists of two parts, as shown in the illustration—a lower base and an upper head with flanges which are crimped about the enlargement at the top of the base section. Rails of this type are in use in Leeds, England. The rails in Leeds are said to show no signs of corrugation after five years of service. The composite rails laid in Leeds weigh 121 lb. per yard, and since they were put down in 1906 have carried 1,350,000 axles weighing 12,300 lb. each. at speeds up to 18 m.p.h., in addition to exceptionally heavy truck, traffic. It is said that they are good for another five years of service before it will be necessary to renew the heads. Two curves have been built of this type of rail on the Paris tramways system—one on the subway and one on the surface lines—and the rails there are said to show excellent wearing qualities.

The chief feature of the Romapac rail is the renewable head. As designed for use in Chicago this head will weigh 81 lb. per yard and the base will weigh 77 lb. per yard. The combined weight of 158 lb. thus exceeds the weight of the present Chicago rail, 129 lb., by 29 lb. per yard, and the first cost for steel is increased accordingly. However, when a renewal has to be made only the head of the Romapac rail need be renewed. With the present type of girder rail it is necessary to renew the entire rail weighing 129 lb. per yard. With the Romapac type the renewed portion will weigh only 81 lb. and thus there will be a saving on renewals of 48 lb. per yard.

Another large saving expected is that for paving work at the time of renewal. The Chicago work contemplates that if the foundation at the time of renewal is in good condition it will not be disturbed. Only the head of the Romapac rail will be renewed and this can be done with a minimum disturbance of the pavement. Only the stretcher blocks will have to be removed during the renewing process. An estimate made by the Board of Supervising Engineers shows that the total cost of renewals with the Romapac rail will be $8,000 less per mile than the cost of renewing with the present track rail.



The flange head of the Romapac rail is applied to the base by cold rolling. This work is done by a steam-driven machine carrying rollers which bend the lower flanges of the head securely into place about the bulb on the base. The rolling machine operates under its own tractive power and makes several passes over the rail head to perform the cold-bending process. The capacity of the machine is about 700 feet of rail per hour and the rolls operate on one rail at a time. The cost of operating one of these machines is estimated at 56 cents per hour.

When renewal is made the rollers on the machine are replaced by rolling cutters which make a V-shaped groove on the side of the head at the point of maximum bend. The lower flange is then broken off by claws attached to the rolling machine and thus the head is released and the base made ready for the addition of a new head section."

Large Blowing Sets

The Massey Harris Company, Limited, of Toronto, are installing in their new foundry, two large, motor driven, composite blowers, capable of delivering 12,000 cu. ft. of air per minute against a pressure of 16 ounces. These sets are being supplied by Chapman & Walker, Limited, engineers, Toronto.

Electrical Railway Progress

During the last year or so there have been very important developments in electric railway appliances. With street railways, cars and loads have become heavier and schedule speeds have increased. In spite of these conditions, progressive managers have been able to reduce maintenance costs, adopting the modern equipment designed to operate with minimum expense for repairs. Existing interurban lines have extended and many new properties have come into existence. Steam railroad men have become less timid in regard to electrification, and several very important steam road installations have been made.

Among the noteworthy installations that have been made or contracted for during the past year may be mentioned the following: Boston & Maine Railroad, Hoosac tunnel electrification, 11,000 volts, single phase complete equipment. New York, West Chester & Boston Railroad, 11,000 volts, single phase; motors and control. Rock Island & Southern Railroad, 11,000 volts, single phase; motors and control. Piedmont Traction Company, 1,500 volts, direct-current; complete station, car and locomotive equipments. Oakland & Antioch Traction Company, 600-1,200 volts, direct-current, motors and control. Westinghouse equipment has been specified on all the above-mentioned in addition to which the same company has installed a number of 600 volt d.c. systems. The following paragraphs indicate briefly the recent general trend of street railway progress:

The Single-Phase System

The single-phase system has been adopted for three very important projects: The Hoosac tunnel electrification, the Rock Island & Southern, and the New York, Westchester & Boston installations. The fact that this system was selected after exhaustive studies effectively substantiates the claim of its advocates as to the advantages of single-phase operation under certain conditions. Seventeen additional single-phase locomotives have been purchased by the New York, New Haven & Hartford Railroad for operation on its main line. The single-phase operation of the recently electrified Hoosac tunnel installation is eminently satisfactory.

The High Voltage Direct-Current System

The Piedmont Traction Company has contracted for complete equipment for its 1,500 volt direct current system, the details of which are as follows: About 280 miles of track are to be electrified for passenger and freight service. This is the longest direct-current road in the country and the voltage is the highest ever used for a direct-current railway in America.

Interpole Railway Motors

The demand for interpole railway motors has increased wonderfully during the past year. Many companies that did not at first sufficiently appreciate the advantages of inter-pole construction and were slow to change over from non-interpole motors are standardizing motors of one of the interpole types. Interpole motors are being specified for nearly all new equipment and can now be furnished for practically all commercial railway applications. Interpole motors have not heretofore been made of the smaller capacities but companies operating small cars that have not in the past been able to avail themselves of the advantages of interpole construction can now do so.

Forced Ventilation

The advantages of forced ventilation for railway motors are now being appreciated by operators. Forced motor ventilation has been used for the motors installed on the Long Island Railway and the Pennsylvania Railway motor cars and has proven particularly successful. Forced ventilation has also frequently been used on locomotives. The New York, New Haven and Hartford, the St. Clair Tunnel, the Spokane and Inland, and others have been so equipped.

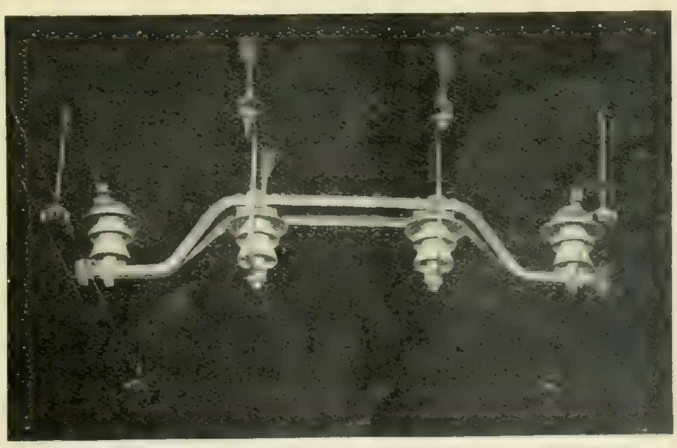
Unit Switch Control

There has been a feeling among operators that unit switch control can be used with economy only for the control of long trains or for heavy high speed cars. That this impression is erroneous is indicated by the order recently placed by the Boston Elevated Railroad Company for 50 equipments of unit switch control for its surface cars. This makes a total of 100 surface car unit switch equipments operated by this company. Unit switch control is becoming popular not alone because it tends to reduce car maintenance but because it removes all heavy current carrying parts from car platforms and eliminates all annoying troubles and claims resulting from controlled burn-outs.

The Hoosac Tunnel Electrification

The Hoosac Tunnel electrification of the Boston & Albany Railroad included the equipment of a total of 13.31 miles of track for electrical operation and five electric locomotives and power house equipment. Of the total track electrified, 50,100 ft. is within the tunnel which is double-tracked and 4.75 miles long. Previous to electrification the tunnel limited the traffic on the division because of the steam and smoke incidental to steam operation. Block signals were not feasible because they could not be seen. Passenger traffic was inconvenienced by the dirt, smoke, and gases. Since electrification the air in the tunnel is always pure and clean.

An electric locomotive hauls through every train and its steam locomotive with banked fires. Block signals are being installed and the capacity of the tunnel will be increased over 100 per cent. The Westinghouse Company



11,000 Volt Single-phase Line Construction in the Hoosac Tunnel.

furnished the entire equipment including all control apparatus, station equipment and the 11,000 volt overhead line material. Six locomotives have been in service since the latter part of May, each having a rating of approximately 1,500 h.p. Half of these are geared for a speed of 30 miles per hour for hauling heavy freight trains. The others are

geared for 50 miles per hour and are used for handling the passenger service.

The Rock Island & Southern Railway

The Rock Island & Southern Railway commenced operating its 11,000 volt single-phase road early in the year and the equipment has given complete satisfaction. The road is 49.7 miles long and the passenger cars are each equipped with four motors, rated at 100 h.p.. and with unit switch control. One express is equipped with four No. 136 motors, and unit switch control and one freight car is equipped with four No. 136 motors and unit switch control.

New York, Westchester & Boston

The New York, Westchester and Boston Railway Company, a subsidiary of the New York, New Haven & Hartford, is also being electrified with single-phase system at 11,000 volts. The equipments will be used for high speed passenger service with multiple unit cars and will be interchangeable with those on the New Haven line, but will operate on alternating-current only. This road will start from 180th street, New York City, and terminate at White Plains, fifteen miles distant. A branch two miles long leaves the main line five miles from 180th street and extends to New Rochelle. Energy will be delivered to the cars at 11,000 volts. 25 cycles, and the equipment includes 30 motor cars each propelled by two No. 409-B motors with multiple unit control, and one 80-ton switching locomotive equipped with quadruple No. 410 motors.

New York, New Haven & Hartford

The New York, New Haven & Hartford Railroad Company has been extending its electrified zone and has purchased seventeen additional Westinghouse single-phase locomotives. This order, coming in the wake of the initial orders, constitutes further and conclusive evidence as to the reliability of single-phase apparatus. The latest single-phase locomotive ordered by the New Haven Railroay is equipped with four driving axles, but has eight motors, two motors geared to a quill surrounding each axle. This equipment, which at first appears more complicated, is in reality, said to be lighter and cheaper than a locomotive of the same capacity having four motors of the same total capacity. This type permits the use of small motors for locomotives of large capacity and the matter of repairs is greatly simplified. Each of the small motors has practically one-half the number of brushes, brushholders, armature field coils, etc., as has one large motor, so that there is the same total number of these parts on the locomotive as on one equipped with larger motors. Both motor pinions drive the same gear which permits the use of only one gear on the quill, while the large motor requires twin gears. It is believed by the manufacturers that this type of locomotive marks a decided advance in the art of building electric locomotives.

The method of controlling the speed of electric railway motors by varying the strength of the field has also been developed to a commercial basis. The speed of the passenger locomotives on the New York, New Haven & Hartford Railroad, when operating on direct-current, is controlled by the varying strength of the motor fields. This system was so successful after having been operated about four years, that the same plan was adopted for the Pennsylvania railroad locomotives for its New York City Terminal installation.

The Pennsylvania Railroad Electrification

The locomotives on this road, said to be the most powerful in existence, haul all the trains from Manhattan Transfer near Newark, New Jersey, into the new station in the heart of New York City. Operation is at 600 volts d.c. The use of field control for speed regulation enables them to run when necessary at very high speeds and at the same time to start the heavy limited trains and to operate them over certain sections at low speeds with minimum power consumption. Each locomotive weighs, complete, 157 tons and exerts a maximum draw bar pull of 79,200 lbs. The normal speed with full train is 66 miles per hour. The operation of the Pennsylvania locomotives has been conspicuous for its successful record. On the Pennsylvania locomotives the motors are connected, first with full field series; second, normal field series; third, full field parallel; fourth, normal field parallel. This method gives four highly efficient operating speeds. The full field gives an enormous tractive effort at slow speeds and the normal field permits them to haul comparatively heavy loads, at high speeds, thus enabling the motors to efficiently operate over a much wider range of speed than would be possible without the field control. This whole Pennsylvania installation is said to have been remarkably successful. The commutation of the motors is excellent and their operation demonstrates the great flexibility of modern interpole railway motors and their adaptability to conditions which could not be satisfied by non-interpole motors.

The Piedmont Traction Company

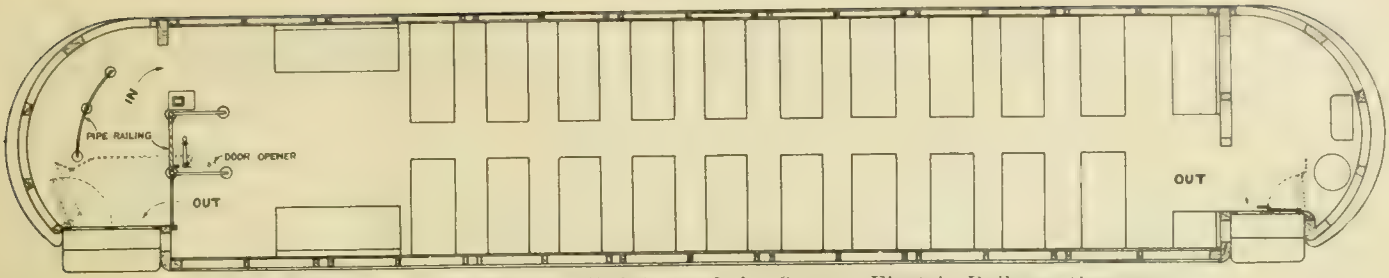
The Piedmont Traction Company and the Greenville, Spartanburg & Anderson Railway Company will be equipped and operated with 1,500-volt direct-current apparatus. These roads form two branches of a new railway system in North and South Carolina. This is probably the largest electrification project ever undertaken, as the property consists of about 280 miles of track and the equipment will include both cars and locomotives, the latter to be used for freight service.

Electro-pneumatic control which is peculiarly adapted for use on high tension direct-current voltages will be used, and while the motors will be of Westinghouse standard interpole construction, the matter of commutation has been given special attention. The control for the passenger cars, express cars, and locomotives will be standard HL unit switch type, but a special feature is in the dynamotor compressor. This form of compressor is designed for use in connection with the air-brake outfit. The air compressor is driven by a continuously running dynamotor instead of the usual intermittently running compressor motor. The dynamotor drives the compressor by means of a friction clutch of the standard automobile type, which is automatically cut in or out when the air reaches a certain pressure limit. The dynamotor ordinarily furnishes power for the control and lights, but in this case it serves also to operate the compressor making unnecessary the use of a separate motor.

The Cambria Subway

The Cambria Subway in Boston is a new and notable rapid transit project. This subway, which is almost completed, will reduce the schedule between Harvard Square, Cambridge and Park street to eight minutes. There are but two stations between terminals, one is in Central and the other in Kendall Square. The subway will cost $8.-000,000. The electrical energy will be supplied to the cars at 600 volts direct-current. All of the car equipment, consisting of outfits of No. 300 interpole motors and AL unit switch control will be furnished by the Westinghouse company.

The Government of Manitoba is reported to have bought land on Charlotte street on which will be built an extension of its telephone buildings and equipment in the near future.



Design Showing one of Remodelled Cars of the Ottawa Electric Railway Company

Ottawa Electric Remodelling Their Cars

The Ottawa Electric Railway Company is at present remodelling and converting to "pay-as-you-enter," a number of 38-ft. body interurban cars, which they have had in service for some years. The arrangement being adopted is somewhat different from anything yet put into service, but it is already showing evidence of becoming a very popular one for cars of this type, as well as for cars of a smaller type for city service. The design of a remodelled car is shown in the accompanying sketch.

The rear platform, steps and entrance which were originally 36 in. wide with a single hinged door is being made 48 in. wide and fitted with an automatic folding door, which will be controlled by the conductor. The rear bulkhead partition is being eliminated entirely, and an iron pipe railing placed at centre forming suitable protection for the conductor.

The door in front bulkhead partition which was originally in the centre, is being moved to the right hand or step side in order that passengers may leave car via same without interfering with motorman or his duties. The front vestibule door is also being made automatic folding and will be controlled by the motorman.

As above mentioned, the new arrangement for these cars is being highly commented on by railway men who have looked it over, and its adoption is fully expected by many roads for new cars, as well as old ones. The seats which were originally reversible and upholstered in plush have been replaced with non-reversible seats upholstered in rattan. These cars although having been in service before for some years, as stated, are still in perfect alignment and good repair.

The work of remodeling is being done by The Ottawa Car Company, Limited, Ottawa, Ont., by whom the cars were originally built.

The Montreal Tramways Co.

Shareholders in the Montreal Street Railway Company, at a special meeting on October 5th, decided, by a vote of 61,391 shares to 3,627 shares, to convey the properties of the Montreal Street Railway Company, the Park and Island Railway Company, the Montreal Terminal Railway Company, and the Public Service Corporation to the Montreal Tramway Company on terms that the holder of one share of the Montreal Street Railway Company will receive $87.-50 in cash and $160.00 in five per cent. debenture stock and $20.00 in common stock of the Montreal Tramways Company. In the alternative shareholders can receive $250.00 in five per cent. debenture stock and $20.00 in common stock of the Montreal Tramways Company in case anyone desires to take the full consideration in securities of the Montreal Tramways Company.

The M. S. R. capital is ten millions, which when exchanged will be represented by two million out of the total twenty million of the Tramway Company's authorized common stock, by $16,000,000 of debenture stock, and by a cash charge of $8,750,000 against the new company, equivalent to $9,000,000 more debenture stock. There is practically no independently-owned stock of the lesser companies outstanding, all being owned by the M. S. R., and the new Tramways Company will simply take possession of the properties of these roads under the merger act of last session at Quebec.

Mr. E. A. Robert, the chairman, explained that the reorganization was simply a matter of internal economy, and would simplify dealings between the company and different municipalities when questions of franchise had to be considered. Strong opposition to the scheme was made by Senator Beique and ex-judge Ouimet, mainly on the ground that there was no advantage in the consolidation, and that further consideration was necessary. During the discussion it was brought out that the company had arranged for the sale of $10,000,000 five per cent. bonds at 95 net, with accrued interest, to the Boston and New York firm of N. W. Harris & Company.

Following on the decision of the shareholders comes the news that the Railway Commissioners have refused to authorize the amalgamation of the Park & Island and the Terminal with the Montreal Street Railway, on the ground that they have no jurisdiction. The reason for the non-jurisdiction is that the two former companies are acting under Federal, and the Montreal Street under a Provincial charter. The Street Railway Company has already obtained powers for amalgamation from the Provincial Legislature, and will no doubt attempt to secure Provincial charters for the two other companies.

M & S. C. Extensions

The Montreal & Southern Counties Railway is gradually extending its borders. The company has been granted by the Grand Trunk Railway a long lease of the Central Vermont from St. Lambert to Waterloo; the line is to be electrified, and the road operated by the Montreal and Southern Counties Company. The old roadbed is to be renewed and 80 lb. rails laid throughout. New electric engines for freight and passenger purposes are to be purchased; the latter will be equipped with four motors of 100 h.p. each, and will be capable of a speed of 60 miles per hour. New car barns, of concrete and brick, will be constructed at St. Lambert, and additional power sub-stations at St. Lambert and Chambly. Hitherto the company has generated its own power, but a contract has now been made with the Montreal Light, Heat and Power Company for the supply of all that is necessary. The engineers are also preparing plans for connecting St. Lambert with Chambly Basin, Chambly Canton, and Richelieu, next spring.

Two or three plans have been submitted to the Montreal Council for a new spur line, in the city, starting from their present terminus at Grey Nun street. The latest proposal is to construct a line along St. Paul street west to Inspector, from thence to Notre Dame, across Chaboillez Square, up Cathedral and Metcalf streets to St. Catherine street. A Y will be put in at the north end of Dominion Square at the rear of the proposed Mount Royal Hotel.

Electrical Activity in Montreal

River Commission at Montreal

With the approval of the Governor-General the Dominion Government has appointed a commission, with the title of "The River Commission," to examine, investigate and report upon all proposed power development works on the River St. Lawrence between the head of Lake St. Francis and the city of Montreal in their relation to navigation, present and future, and the effect of the proposed and existing power developments upon navigation of that part of the river under present conditions of depth and also under possible improved conditions to provide for a navigable depth of from 22 to 25 feet. The commission consists of Prof. C. H. McLeod, of McGill University, as chairman; Mr. W. I. Gear and Mr. Arthur Surveyor of Montreal.

The commission is empowered to hear evidence, examine plans and study the various proposed power development schemes, together with requirements of existing power developments in their relation one to another and in so far as they affect navigation; to harmonize the various projects, suggest modifications and remedial works which will be effective in preserving the present navigable depths and make it possible to utilize the river for a larger scale of navigation, even to 22 or 25 feet if found advisable later on.

The commission is now engaged in gathering data as to the rights of the various companies under their charters and as to the conditions of surveys of the region. It is also taking steps to supplement existing information with a view to getting knowledge which will assist in the study of the projects.

Electrical Association of Province of Quebec

Mr. N. Simoneau, president, occupied the chair at the first general meeting of the year of the Electrical Association of the Province of Quebec, held in the Builders' Exchange, Montreal. The chief subject of discussion was the continued affiliation with the Builders' Exchange, at an annual cost of $200. The question was discussed very fully, some members being of opinion that the cost of the affiliation was too high, considering the use made by the members of the exchange. There were, it was argued, members to whom the exchange is of little or no value. On the other hand, it was asserted that the members should make more use of the exchange, and take advantage of the undoubted facilities it offered for securing business. Of course, if the members refused to do this, it was useless to spend money for this purpose.

It was suggested that the membership might be divided into two classes—those who desired to use the exchange and would pay an annual subscription of $10; and those who thought the exchange was of no benefit to them and were willing to pay $5 per annum; but to this it was objected that those paying the higher sum would be contributing more than their fair share of the expenses of the association, having regard to the fact that $200 would have to be guaranteed to the Exchange. Ultimately, it was decided by a majority, on the motion of Mr. Shaw, seconded by Mr. Thomson, to resign from the Exchange at the end of the current year.

Mr. Shaw suggested that in order to increase the membership a more practical turn should be given to the association by means of lectures and the exhibition of appliances. This was favorably regarded, and a committee consisting of Messrs. Shaw, Dietrich and Thomson, was appointed to obtain papers on various subjects. Mr. Shaw promised the first paper, which will be followed by a discussion.

It was further decided that, in order to promote the membership among French-Canadians and to arouse their interest in the proceedings, an evening should be set aside for discussion in French and English. This is to be tried as an experiment, and if successful, it was proposed to hold the alternate meetings in French and English.

The weekly luncheon of the members is to be held at Cooper's restaurant every Thursday between 12 and 1.

Montreal City Gets Large Cheque

In payment of a percentage on the gross earning during the fiscal year of 1911, the Montreal council has received a cheque for $335,007 from the Street Railway Company. The total earnings were $4,793,042, but the company has deducted $1,026,323 which it claims were collected in the outside municipalities and on which no percentage is leviable. The percentage on earnings ranges from four to fifteen per cent., according to the amounts. The following gives the gross earnings, amount on which the percentage is paid, deductions, and the sums paid to the city since 1905:

	Gross	Paid on	Deducted	Paid to city
1905	$2,648,733	$2,377,241	$271,492	$147,724
1906	3,008,550	2,646,554	361,996	177,586
1907	3,468,928	2,947,352	521,575	213,682
1908	3,660,758	3,146,447	514,310	241,967
1909	3,847,459	3,261,145	586,314	259,171
1910	4,281,473	3,377,456	904,016	276,618
1911	4,793,042	3,766,719	1,026,323	335.007

Miscellaneous

Mr. G. S. Stuart has been transferred from the Toronto office of the Canadian General Electric Company to Montreal, as agent.

The Shawinigan Power Company is offering shareholders $1,000.000 new stock at 108, on the basis of one share of new stock for nine shares of old.

The Montreal Street Railway Company has come to an agreement with the city regarding the action taken over the company widening the devil strip on Mary Ann street, which resulted in the city's paving works being held up.

Messrs. Haney-Quinlan & Robertson, of Montreal, have secured a contract for the construction of a concrete dam at High Falls, Que., on the Lievre River, for James McLaren & Company, Limited, lumber merchants, Buckingham. It will cost about $200,000. Mr. J. B. McRae, of Ottawa, is the engineer.

Mr. J. W. McConnell and Mr. S. H. Ewing, of Montreal, have resigned their seats on the board of the Quebec Railway, Light, Heat & Power Co. To fill these vacancies, and the one created by the death of the Hon. E. Garneau, of Quebec, Messrs. Louis Galliard, Antony Thierree, and Maxime Beauvesage, all of Paris, have been elected.

The citizens of Montreal West have decided to give the Montreal, Park & Island Railway Company a franchise for

fifty years to run their electric cars on certain streets, in order to give the residents an easier access to the city. The company is to be given exemption from all municipal taxes, and in return will run a 20 minute service at a five cent fare.

At the Windsor Hotel, Montreal, the Robb Engineering Company, Limited, Amherst, Nova Scotia, are installing three Robb water-tube boilers of 200 h.p. each, and three Robb-Armstrong vertical 2-crank compound engines, 14 and 20 x 8, for direct-connection to electric generators of 150 kw. capacity each. These engines are to run at 435 revolutions per minute.

Mr. Howard Murray, treasurer of the Shawinigan Power Company, is president of the new Canada Carbide Company, a consolidation of the Willson Carbide Company, the Ottawa Carbide Company, and the Shawinigan Carbide Company. Mr. D. D. McTavish is vice-president and general manager of the company, and Mr. W. S. Hart, secretary. The Ottawa works have been closed as the capacity at Merritton and Shawinigan is sufficient to supply the demand at present.

On the demand of the president, Mr. J. T. R. Laurendeau, the King Edward Park Company has gone into liquidation. It owns a pleasure resort just outside Montreal and several claims were made against it owing to an accident. Some electrical firms are interested; the Canadian General Electric Company had entered a suit for $2,631; the E. F. Phillips Electrical Company for $1,112, and the Canada Foundry Company for $1,588.

There has been some further vague talk in Montreal as to building underground electric railways to relieve the congested traffic of the street cars. The question of whether the city should build the lines and operate them or leave them to a private company has been discussed in an informal way by some aldermen, but nothing definite has been done. The street railway company has power to construct underground lines in the city limits within three years.

Mr. P. Larocque has been appointed secretary of the Montreal Electrical Commission appointed by the city to draw up plans for the construction of underground conduits for carrying telephone and other wires. The city has given the members further powers to obtain all necessary information from companies and from the city engineer, and the commission is now engaged in gathering the requisite data. The office is at the Yorkshire Insurance building, St. James street.

Mr. Francis Dagger, of Toronto, is still at work compiling information, on instruction from the Montreal council, to be laid before the Railway Commission in connection with the city's application for a revision of the Bell Telephone Company's rates. The company has supplied the city with details of its plans and lines, while reports have also been received of the systems, charges, etc., in operation in various cities in Canada, Great Britain and the United States.

Many electrical contractors in Montreal complain of the shortage of men. The contractors are, as a rule, very busy, and could employ many more workmen; in fact, the head of one firm stated that there is enough work for fifty more men if they could be obtained. The result of this short supply is that some firms have been "stealing" the workmen of their competitors. Wages have of late been on the up-grade, but in spite of this, enough workmen cannot be secured.

At the annual meeting of the directors of the Canadian Light and Power Company, Montreal, the report of vice-president E. A. Robert was read and accepted. The old board of directors was re-elected and the name of Mr. J. M. McIntyre added to the list. The following are the board of directors for the year: F. H. Wilson, president; E. A Robert, vice-president; Nathaniel Curry, Hon. J. M. Wilson, J. W. McConnell, George Foster, K.C., Wm. C. Finley, R. N. Smyth, Fred J. Shaw, and J. M. McIntyre.

It was stated by Mr. Andrew A. Allan at the annual meeting of the Marconi Wireless Company of Canada held in Montreal, that the company was making good progress, the ship to shore receipts indicating a considerable increase, while the trans-Atlantic business is now well established. The report also stated that the work on the Great Lakes had been started, that several vessels had been equipped with wireless, and it was hoped that more would be so when the station work on the Great Lakes is completed.

The Sayer Electric Company, 85 Bleury street, Montreal, have recently been awarded contracts for installations for the following Montreal buildings: The Evanscourt apartments, Mayor street; the Gillette Safety Razor Company of Canada, Limited, new factory, St. Alexander street; the Coronation building, St. Catherine street west; the Canadian Economic Lubricant Company, Limited, Durocher and Atlantic avenue; Mr. J. P. O'Shea's glass warehouse, Ste. Agathe street, and the residences of Messrs. Clarence I. De Sola and A. McKim.

The Robb Engineering Company, Limited, have recently taken the general agency for Canada of the gas engines and suction gas producers made by Davey, Paxman & Company, Limited, of Colchester, England ,who are well known in connection with the latest developments in internal combustion engines. The Paxman gas engine is made in a full line of sizes from 2½ to 300 horse power. Those larger than 20 horse power are equipped with a compressed-air self-starter which starts the engine with the same ease and certainty as a steam engine.

The Northern Electric and Manufacturing Company, Ltd., Montreal, has secured a contract from the Dominion Iron and Steel Company, Sydney, N. S., for a new telephone switch board, telephone power plant, and central battery telephones. This will give the company one of the largest and best equipped private telephone systems in the country. For the same corporation, the Northern Electric has obtained an order for a very large power board for new power plant. Another contract is for a 24 point apartment telephone system to be installed in an apartment house constructed for Mr. Adams on Prince Arthur street, Montreal.

The Robb Engineering Company, Limited, Amherst, N.S., have recently sold heating boilers to the following companies: C. C. Young Company, Winnipeg, Man.; John Plaxton Company, Winnipeg, Man.; K. G. Hagen & Company, Amherst, N.S.; Gorman, Clancey & Grindley, Edmonton, Alta.; R. C. Thomas & Company, Calgary, Alta.

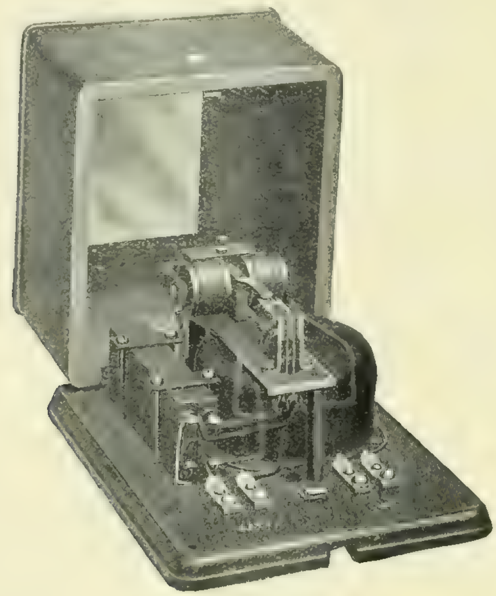
The Reynolds Electric Flasher Manufacturing Company have opened a branch office in the Electric Building, San Francisco, which will be in charge of Mr. Henry F. Frosch. This office will serve the Pacific coast, and adjacent States.

Canadian Telephone News

The Niagara, St. Catharines and Toronto Railway Company Instal an Interrupter for Code Signalling

In railway service it is often desirable to eliminate the loss of time occasioned by the use of hand generators. On magneto lines where a large number of messages are sent daily this is an important feature and with telephone lines between block-towers the quickest possible method of calling is demanded.

The interrupter illustrated herewith is designed especially for this class of work and was first adapted for use with tower systems. With small lines in railway yards, line sidings, etc., where several telephones may be connected to the same pair of wires, it has also proved itself of the greatest benefit. It is not limited, however, to this class of service, but is very efficient in all code ringing work, as the signals due to the sensitive mechanism can be made very clear and distinct.

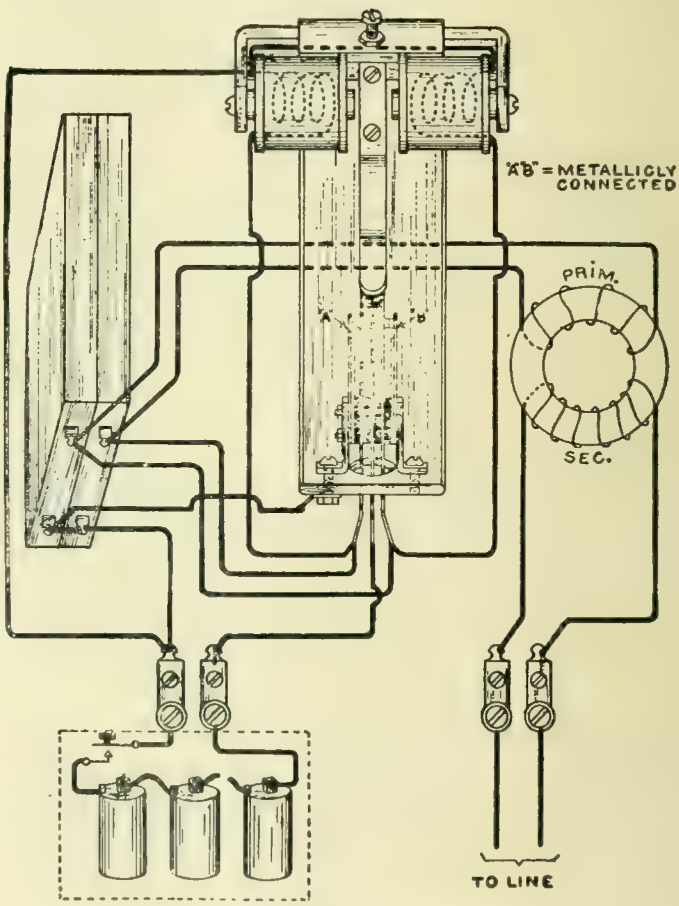


Interrupter, cover removed.

Its construction is the simplest possible. It is operated by means of a key or push button which closes the battery circuit containing four to eight dry cells. The number of cells depends upon the number of bells it is desired to ring. It is recommended that five dry cells be used, which will ring efficiently fourteen 1000-ohm ringers or sixteen 2500-ohm ringers on a line of 500 ohms resistance. This is about the equivalent of a 30-mile metallic circuit of No. 12 B. & S. copper wire. As the interrupter operates only when the battery circuit is closed, it is most economical in current consumption. It is adjusted so that it responds at once when the key is pressed closing the battery circuit. The contact points are platinum and the mechanism is practically noiseless and sparkless. Although very sensitive, it is built in a substantial manner, which insures long service and low maintenance.

The circuit diagram of the interrupter is shown in the second figure, and from this the method of working can be easily understood. As the alternate paths for the battery current are opened and closed by the action of the [illegible] the current is automatically reversed in the primary of the transformer whose secondary is connected to the line. Condensers are connected across the make and break contacts to prevent sparking at these points. The interrupter is intended to be mounted normally on the wall in a vertical position and is enclosed in an oak cabinet. The mechanism is mounted upon the base of the cabinet and is protected by a hinged cover. This cover is provided with a glass window through which the operation of the mechanism can be observed when the cover is closed. When the cover is thrown open, all the mechanism is readily accessible for adjustment, test and inspection. It is believed that many railroads at the present time experiencing difficulties with magneto systems on account of complicated codes employed and the consequent time needed in ringing these. would be able to eliminate much of this difficulty by the use of such an interrupter. The apparatus is manufactured by the Northern Electric & Manufacturing Company, Montreal, whose railway department is equipped to advise any road whether or not its conditions are suitable for the use of such an instrument.

A few weeks ago the Niagara St. Catharines & Toronto Railway Company placed an order for one of these instruments. This railway is an example of the possibilities of the telephone in train despatching, for although they are still using the magneto system they were able last year to handle something like 4,000,000 passengers and 40,000 cars of freight. Their superintendent, Mr. W. R. Robertson, states that this would be entirely impossible with any other system of handling their service.



CIRCUIT DIAGRAM

Long Distance Speaking Without Wires

Consul General John L. Griffiths, London, England, writing in Daily Consular and Trade Reports, says:

"Experiments have been conducted for some time past near Chepstow for the transmission of the human voice over long distances with the aid alone of the natural elements. The inventor, Mr. Grindell Matthews, it is stated, submitted his discovery recently to a severe test in the presence of a number of experts. He was placed in the strong room of a big London commercial house and locked in, with 9 inches of armor steel, 9 inches of fire brick, and 6 feet of concrete between him and the outer world. By means of his small portable apparatus he carried on a conversation with an operator in another room on the farther side of the building. So distinct and faithful was the transmission that the experts in attendance were actually able to hear the tick of his watch, notwithstanding the almost impenetrable mass between the two instruments.

"The inventor contemplates a further test through five miles of solid rock between Chepstow and Tintern. He is engaged in long-distance tests in connection with the War Office, and on September 9, 1911, spoke from Beachley, in Gloucestershire, to a point over five and one-half miles away near the Severn Tunnel outlet on the opposite side of the river. He intends to carry on experiments between Chepstow and Cardiff, about twenty-five miles. If he does this successfully he is to go to Aldershot to conduct some final demonstrations with a view to concluding negotiations for the transfer of his rights in the United Kingdom to the government."

Telephone Notes

Work is in progress installing the wires of the government telephone system in Saskatoon along the main streets underground.

The Benson Rural Telephone Company has been incorporated under the Province of Saskatchewan Act. Edward J. Wright, registrar.

A large amount of underground work is being carried on in Edmonton by the telephone department of that city. When the work is completed they will have about two miles of underground conduit.

The directors of the Bell Telephone Company have increased the paid up capital from $12,500,000 to $15,000,000. The new stock will be issued at par to the shareholders in the proportion of one new share to every five of old.

The government is said to have completed arrangements for the expenditure of $250,000 on the installation of an automatic telephone system in Saskatoon. It will provide at the outset for 2,000 customers.

A new directory just issued at Portage la Prairie contains the names of 650 subscribers within the city limits, and a rural list of 550. By the end of the present season about 1,700 new rural telephones will have been added throughout the province.

The Rural Telephone System is being further extended in the Camrose district. A construction gang is at present working south from Daysland to the Hastings Coulee country. The next extension will be north of Camrose to Kingsman and Pretty Hill, a distance of twenty miles.

The agitation against the B. C. Telephone Company, which resulted in the appointment of a committee to look into the question of the installation of a municipal duplicate system has resulted in a decision to approach the company for a figure at which they will sell out their business to the city.

Personal

Mr. I. W. Smith, formerly with the Randall Telephone Manufacturing Company of New York City, has joined the sales organization of the Stromberg-Carlson Telephone Manufacturing Company's Ontario branch office, 72 Victoria street, Toronto Canada.

Mr. R. J. Hill, for the past eight years superintendent of the Central Electric and Gas Company's plant, the private system recently taken over by the city of Portage la Prairie, has now been appointed superintendent of that city's light and power plant.

Mr. Parker H. Kemble, general sales manager of the Toronto Electric Light Company, has been appointed chairman of the Canadian Electrical Association Committee on Rates and Contracts and also chairman of the committee on Meetings and Papers of the Toronto section of the A. I. E. E.

Mr. James W. Moncur, who for the past five years has been connected with the E. T. Wright Company, has severed his connection with that firm and has accepted the management of the Montreal branch of the Canadian Tungsten Lamp Company. Mr. Moncur retains his old territory, from Kingston east to Halifax, where he has become so familiar a land mark.

Mr. W. H. Eisenbeis for many years connected with the Westinghouse Electric and Manufacturing Company of Toronto, has severed his connection with that company to go into business for himself in Pittsburg. Mr. Eisenbeis will long be remembered by engineers in and around Toronto as the secretary of the Toronto branch of the A. I. E. E. to which he gave three years of energetic and helpful service.

Mr. W. T. Grose, the Montreal manager of the Canadian Tungsten Lamp Company, has resigned his position as eastern representative, on account of ill health. Mr. W. H. Ginder, the president, presented Mr. Grose, on behalf of the company, with a handsome piece of silverware, suitably engraved, as a token of the company's appreciation of his hard work during the past three years.

Mr. Gano Dunn Joins J. G. White & Co.

Mr. Gano Dunn has just returned from abroad, where, as a representative of the United States Government, and as president of the American Institute of Electrical Engineers, he has been attending the International Electrical Congress at Turin and the meeting of the International Electrotechnical Commission, the body that has been organized to bring about international uniformity of standards and practice in the electrical industry. Mr. Dunn, who for many years was first vice-president and chief engineer of the Crocker-Wheeler Company, and is a past president of the New York Electrical Society, has been elected a director and vice-president of J. G. White & Company.

The Canadian Fairbanks Company, Limited, has been authorized to change its corporate name to the Canadian Fairbanks-Morse Company, Limited, it having acquired the entire capital stock of the latter concern. The capital is increased from $900,000 to $2,600,000. The above changes have evolved from a greatly increased business, the further development of which will now be much facilitated. The officers of the Canadian Fairbanks-Morse Company, Limited, are Henry J. Fuller, president; Thos. McMillan and T. C. Brooks, vice-presidents; E. R. Whitehead, treasurer.

The Canadian Tungsten Lamp Co.—A Short Description of their Splendidly Equipped Factory

In February last, in response to inquiries from our subscribers, we obtained permission from the Canadian Tungsten Lamp Company, of Hamilton, to describe their laboratory, which had been recently opened in connection with the manufacture of tungsten lamps. It having, however, since been stated on several occasions that this company are not manufacturing any tungsten lamps in Hamilton, we thought it would be of interest to our readers if we could give them a description of this splendidly equipped factory and their mode of manufacturing their "Kolloid-Wolfram" tungsten lamp.

Entering the factory, on the ground floor we pass the laboratory, which we have already described, and enter the grinding room. Here, the tungsten oxide, mixed with certain proportions of zinc, is placed in Krupp iron drums and ground until the metal is sufficiently fine to pass inspection—the grinding taking about 1,000 hours, and the mixture being sifted fifty times through a mesh of 47,000 to the square inch. After going through many chemical and other processes, the tungsten is reduced to metal in an amorphous state and brought into the kneading room where

Section of Pumping Dept.—Canadian Tungsten Factory

skilled workmen knead the tungsten until it is the right consistency for squirting or drawing. The kneading is done in a glass case so that there shall be no possibility of any dust or impurities entering same. The paste is then either placed in brass cylinders to be squirted under heavy pressure through diamond dyes or else is taken to the swageing and drawing room. This is a large room nearly 100 feet in length. Here the tungsten is worked and drawn under great pressure and immense heat (approximately two thousand degrees F.) resulting in the pure drawn wire tungsten filaments known to commerce. The filaments are then taken into the treating room, where every alloy and impurity is destroyed before the filament is mounted on the supports. Before leaving this room, every filament is tested as to its capacity to withstand extreme heat and excessive strain. The filaments are then brought up to the weighing room, where every filament is weighed, measured and sorted so as to insure absolute uniformity in wattage and voltage. Many of the filaments are so fine that it takes three or four to balance a hair from a man's head. The filaments are then sent into the mounting room. Mounting the filaments is a very delicate operation, requiring the care of only the most skillful of operators, not only on account of the fragility of the filaments, but because of their fineness. Having been mounted they are then taken into the fusing room, where the filaments, by a patented device, are fused to the supports, the filaments being practically welded into one piece with the supports.

The mounting of the filaments requires special care;

Portion of Glass Room—Canadian Tungsten Factory

the first operation with the glass is the forming of the stems and leading-in wires. This is done by four operations practically at once, the leading-in wire with platinum connections being welded into the glass and the glass anchor added. The next operation is the making of the various buttons on the glass supports and adding to the support the hollow cane tube which is a portion of a patented device for adjusting the tension on the filaments. The filaments, after being mounted and welded, are taken to the sealing machine, which automatically seals two lamps at

Finishing Room Canadian Tungsten Factory

a time (any size lamps from 2 watts to 1,000 watts). Attached to this machine is an annealer for cooling the immense seals on the large bulbs used for the higher wattage lamps, thus preventing the glass cracking or breaking.

The exhausting department, where both carbon and tungsten lamps are pumped, is a spacious room, being 150 feet long by 50 feet wide. On one side are the carbon

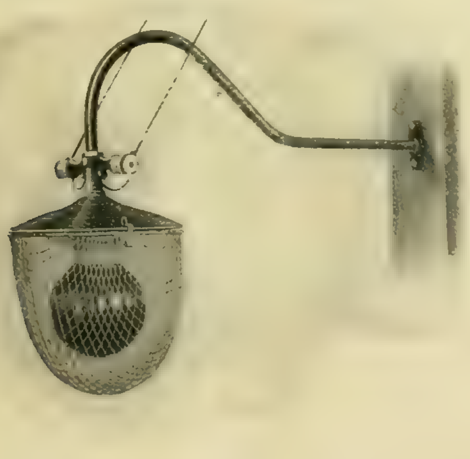
pumps, familiar to most of our readers, having a capacity of about 15,000 lamps per day. On the other side are the tungsten pumps. On each tungsten bench, in addition to the devices for absorbing all gases and moisture there are two vacuum pumps. The finishing vacuum is made on a mercury pump, the lamps leaving the pumps at a vacuum of .00001 mm. of mercury—this high vacuum ensuring long life and greatly minimizing any liability of blackening. The lamps are then taken into the finishing room, supplied along one side with photometers for accurately grading the lamps. Down the centre of the room are the latest form of capping machines, with many special features peculiar to this factory, ensuring that every base is put on firmly and in perfect alignment. On the other side of the room are the various finishing operations, soldering, labelling, cleaning and wrapping—an inspector being in charge of each operation.

Not the least interesting portion of this establishment is the stock room, all the lamps being ranged up in military precision so that the foreman can tell at a glance not only every kind of lamp he may have in stock, but also the exact quantity of each, and this, although several hundred thousand lamps are always on hand. One thing particularly noticeable is the liberal accommodation provided after each operation for an inspecting department—an exceptionally large number of the staff seemingly being employed solely for this purpose.

The officials of the company are pleased at all times to show any of their customers through their plant, reserving practically only one process, being rightfully proud of its complete and handsome equipment. We are indebted for this article to the courtesy of Mr. Harry Crerar, the electrical superintendent; to Mr. Wayringer, who is considered one of the best posted tungsten lamp makers, and to Mr. Smith, the foreman of the glass-room.

Police Telegraph System for Westmount

The police signal system by which constables in all parts of the city can be kept in close touch with police headquarters every moment of the day and night is being adopted by many of the larger cities in Canada. Toronto, Edmonton, Vancouver and Victoria have installed such systems of police telegraphs and only just recently the city of Westmount has decided to follow the same



course. Incidentally it might be said that Westmount is the first city east of Toronto to adopt this system.

With the police patrol telegraph system as installed in Westmount the officer on the beat must report in person and his report is automatically registered on a tape at headquarters which shows the exact time at which the report was received. This would seem to be an improvement over the plan whereby the policeman reports by merely pulling a hook which rings in the number of his box, or where he just telephones in from the most convenient, available phone. By the first system there is no check on the policeman, for anyone can ring in his box

for him; by the second method he must of course report personally, but should the question ever arise later as to whether or not he has reported, it is a case of the policeman's word against that of the desk sergeant.

This system enables the chief of police to get into almost instantaneous touch with any or all of his men that are out on the beat. This is done by means of the signal boxes which are fitted with red or green light, bell and telephone. When the desk sergeant desires to communicate with any or all of his men, he operates a switch on his desk which turns on the light and rings a gong, either on one bell to call the individual policeman on that beat, or on bells over as wide an area as it may be desired to call the patrolmen. The attention of the officer on the beat is at once attracted; he opens his box with a special key, answers the telephone call and receives his instructions.

Thus the officer in charge of the station is at once able to draw all the men distributed over a wide area and concentrate them in case of fire, burglary or for any other emergency that may arise. The whole police force can be mobilized at any particular point just as rapidly as it is possible for them to get there.

Another feature is the patrol wagon call. A conversation with headquarters is not necessary in order to call the wagon. The officer himself inserts his key in the "wagon" keyhole and gives it a turn. This registers the wagon call and box number at headquarters and also gives an audible signal. Simultaneously the call goes to the patrol barns showing the box where the wagon is required.

The Westmount installation was made by the Northern Electric & Manufacturing Company. It is claimed that the system is an economical one inasmuch as it saves the upkeep of a reserve police force. The functions of a police department are for the protection of life, liberty and property, for the preservation of peace and the regulation and enforcement of law and order. It follows therefore that in the proper adminstration of a Police Department it is absolutely essential to have a system that will enable officers and citizens to send news of trouble quickly to police head-

quarters and a system that will enable headquarters to take prompt steps to remedy that trouble. The Westmount system apparently meets these requirements in a highly satisfactory way.

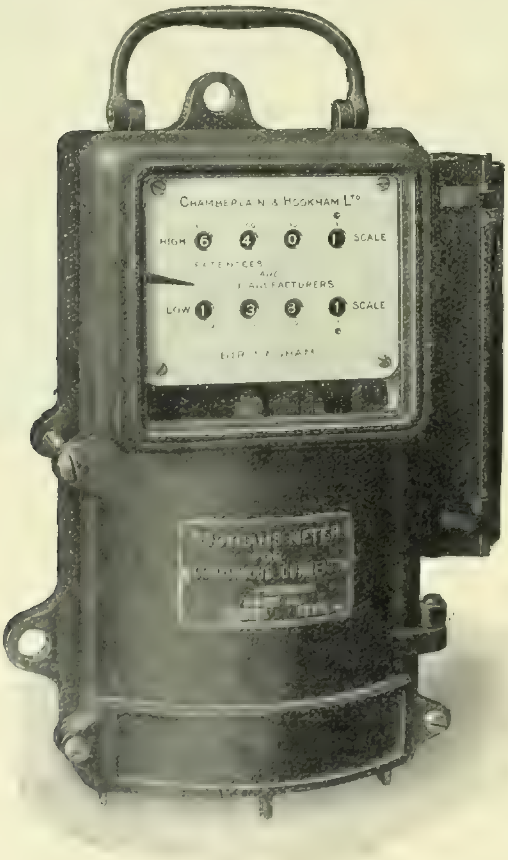
The Two-rate System of Charging

By Ernest E. Sharp, A.M.I.E.E.

In my wanderings through Canada I have not seen the two-rate system in operation and have not found it to have had much attention from electric supply men. I think therefore that some notes on this system regarding its uses in England and in fact Europe generally may be of interest. The two-rate system presents certain features which I think makes it a cosmopolitan system. This opinion is borne out by the fact that to my own knowledge it is in use, not only in Europe, but also in Australia, China, Japan, India, and South Africa.

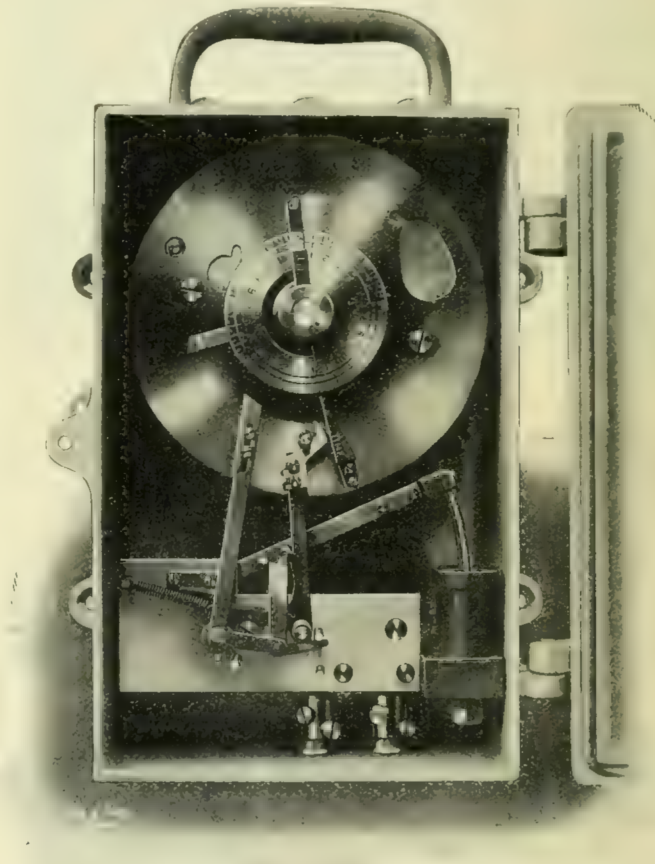
The idea of the two-rate system is to build up a good load factor by providing a means of encouraging the use of current during the off-peak hours of the day and discouraging its use during the peak. A maximum demand system fails in this latter feature and does not even properly meet the former condition as it discourages the installation of any but the absolutely necessary number of lamps, househould appliances, &c.

With the two-rate system as will be seen from the accompanying illustration, Fig. 1, a meter is fitted with the two sets of dials on which the off-peak consumption is separately registered from the peak load. The former is



charged for at a very low rate while the latter is charged for at from four to six times the low rate, depending on local circumstances. The effect of such a system of keeping down the peak is wonderfully satisfactory and in very many cases has put off an extension of the plant for years, while in the meantime it has improved the power factor materially and increased the output to such an extent as to very materially lower the costs of generation.

The high-rate period is usually about two hours, but this depends on the locality. The actual time during which it applies will of course vary with the time of year, so as to follow the seasons' alterations in peak time. In many localities too it may be advisable to differentiate between week days and Sundays. As regards the instruments used for this work, I have not seen any two-rate meters with double-dials in America but have seen instruments in which a resistance is inserted in the pressure circuit during the day to cause the meter to run slower. We used to have this method in England some years back but it is very objectionable. A meter cannot be slowed down to one-fourth its normal rate without seriously af-



fecting its starting current and accuracy, while the fact that an interference of some sort is taking place with the accuracy makes the customer feel uneasy.

On the other hand, the advantages of the method illustrated of using two sets of dials are almost too obvious to need mention. In such an arrangement the changeover from one set of dials to another is effected by a solenoid, the coil of which is connected across the mains and opened and closed by a time switch. This time switch was for years the bugbear of the two-rate system, but with a realization on the part of the manufacturer that a cheap clock was no good for this work and that the switchgear must be of the simplest description, this difficulty has vanished. The great improvement that has been effected is shown by the fact that the British Board of Trade has officially approved a switch for this work, after refusing for years to consider any of the instruments on the market. Such an instrument is shown in Fig. 2. As a clock must be used that runs a long time on one winding it is necessary to take special precautions to ensure accurate running, as the one minute error per day which would be near enough in an ordinary house clock, becomes serious at the end of six weeks running on a time switch clock.

Trade Publications

Rotary Converters,—descriptive leaflet of the Westinghouse rotary converters for railway service.

Engineering Notes.—No. 2, volume 1, a small engineering magazine published by and in the interests of Richard Klinger & Co., engineers, London, E.C.

Canada Foundry Co.—Bulletin No. 38, issued by the Gas Engine Department of the Canada Foundry Company, Limited, Toronto, descriptive of their Premier gas engines.

The Canadian General Electric Company,—Trade letter No. 12, drawing attention to their message vibrator, and twin glower radiator. Condulet talk series 2, No. 3. Also pamphlet "Progress," describing the G. E. receptacles.

Save the Eyes.—A booklet issued by the National X-Ray Reflector Company describing a number of installations in which the indirect scheme of illumination has been worked out with very satisfactory results.

A-B Publications—including catalogue 100, describing the Adams-Bagnall regenerator flame lamps, also a small envelope stuffer applying to the same subject, and another envelope stuffer on ABolites.

Portable Tools—Bulletin No. 22, issued by the Van Dorn & Dutton Company, Cleveland, through their agent, A. R. Oborne, Continental Life Building, Toronto, describing their hard service, portable, electrically operated drills and reamers.

Hotpoint.—Booklet isssued by Dawson & Co., 56 Albert street, Winnipeg, Canadian agents for the Pacific Electric Heating Company, Ontario, California, descriptive of "hotpoint" apparatus, including the usual household appliances.

Rylander & Rudolphs—A booklet devoted to a description of wet and dry cells, carbon brushes, and other carbon products, manufactured by the Rylander & Rudolphs Fabriks Altiebolag, of Sweden, issued through their British agents, James McMillan & Company, London, W.C.

Telephone Publication—A booklet issued by the Kellogg Switchboard & Supply Company, explaining in a non-technical way a number of things about telephones in which the average subscriber is interested, but about which he is apt to be ignorant.

Efficient Gas Power,—Advance bulletin No. 22 issued by the Elyria Gas Power Company, of Elyria, Ohio, descriptive of their "Little Big Engine." The bulletin contains a number of helpful facts about gas engine practice. Well illustrated.

Industrial Schools.—Circular No. 27, issued by the Legislative Assembly of Ontario, containing regulations for the establishment and organization of general, special and co-operative Industrial Schools, for both evening and day classes, throughout the province.

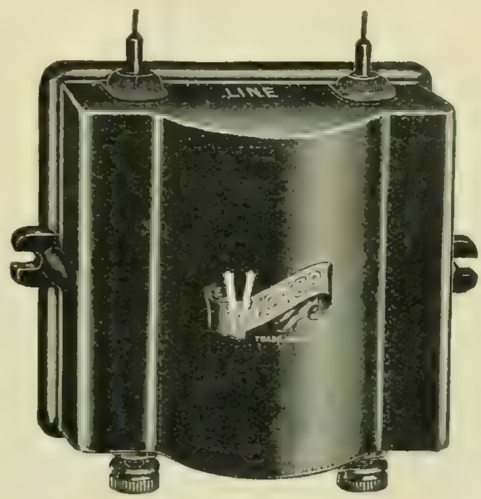
High Efficiency Transformers—Catalogue issued by the Canadian Moloney Electric Company, Windsor, descriptive of their type H. E. transformers. The booklet is particularly well illustrated, and contains valuable information in connection with the wiring up and operation of transformers in general.

Crouse-Hinds Catalogues.—Bulletin No. 12 devoted to the Adjustarod an all-in-one metal equipment for "dead man" anchors; bulletin No. 16 for Imperial Luminous Headlights with long burning electros for interurban and marine service, and bulletin No. 56 for Incandescent Head-lights for use on traction lines and in mines.

Local Battery Telephones,—Bulletin No. 1002 issued by the Stromberg-Carlson Telephone Manufacturing Co., from their Ontario branch office at 72 Victoria street, Toronto. The bulletin describes the latest and most improved types of magneto and local battery telephones. It is unusually well and clearly illustrated and aside from the general information contained should be found specially helpful to men engaged in locating and repairing telephone troubles.

Allis-Chalmers Publications,—The Power and Electrical Department of the Allis Chalmers Co., of Milwaukee have just issued a number of bulletins as follows:—No. 1083, direct-current motors and generators type "K;" No. 1082, engine driven direct-current generators types "I" and "IW;" No. 1078, alternating current generators; No. 1074, direct-current motors and generators types "H" and "HI;" No. 1068, direct-connected Corliss engine; No. 1070, Barometric Condensers type "B;" No. 1519, electric condensers type "AM."

Bell-Ringing Transformers.—Bulletin No. 7 issued by Victor Electric Company, of Chicago, descriptive of their



bell-ringing transformers which reduce the pressure from 110 volts down to either 16, 10 or 6 volts. A cut of one of the Victor transformers is shown herewith.

The Westinghouse Electric and Manufacturing Company have just issued the first edition of a small monthly publication entitled "Small Motors," which is devoted to forming a co-operative bond between the manufacturer and the dealer in small electric motors for general household, store, and office work. The publication is devoted to practical applications of small motors, showing views of motors in actual service, such as operating ice cream freezers, small lathes, washing machines, grinding wheels, and numerous other household devices. An interesting application of the small motor for the household is its use as an auxiliary to the furnace, assisting the heating and ventilating of same. By means of a blower attachment the motor may be used to increase the draft, to increase the distribution of heated air by drawing it from the pipes and forcing it into the room, ventilating a steam-heated room and in numerous other ways to assist in the heating and ventilation of the home. Advice as to installation, operation, and care of the motors is given in short practical talks.

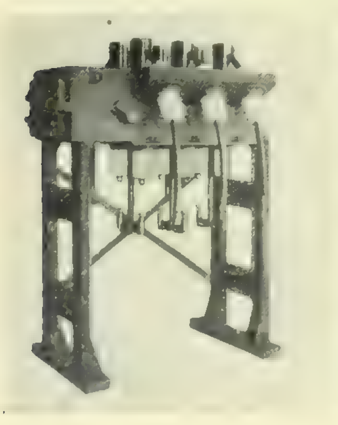
A vigorous campaign for a more extended use of electrical household appliances has been inaugurated in Winnipeg by the Winnipeg Electric Railway Company. There are now a number of the larger Simplex stoves in use, and a rapidly increasing number of irons, vacuum cleaners, toasters and other small appliances in use. The rate of five cents per kw. h. less 10 per cent. which the company is quoting for this service places electric current in active competition with gas for cooking and lighting purposes.

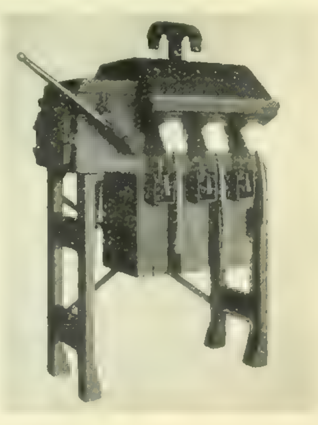
Industrial Progress and Trade Notes

Outdoor Type Oil Circuit-Breakers

Companies distributing electric energy over long transmission lines are often anxious to take on business along these routes. but the volume is usually so small that the consequent revenue does not begin to justify the erection of a sub-station with its attendant expense. The advent, however, of outdoor type apparatus into the field has gone a great way towards solving the problem. By its use, the distributing company may often acquire attractive business in small quantities at a reasonable outlay. One of the most important pieces of apparatus to be considered in such an installation is the oil-switch or circuit-breaker for the control of the feeder circuits. Appreciating the demand for a simple and reliable outdoor type oil circuit-breaker for moderate capacities and voltages, the Westinghouse Electric & Manufacturing Company has placed on the market a modification of the type B breaker which has been successfully used as an indoor type for some years. This breaker has a separate tank for each pole, the tanks being made of welded seam boiler iron with an insulating lining, thus permitting an easy inspection of the contacts. The breakers are made either automatic or non-automatic in the tripping operation. The automatic tripping is effected by the use of current transformers located as an integral part of the circuit breaker, one transformer for a two-pole breaker, three for a three-pole breaker, and two for a four-pole breaker. The breaker is full automatic in its action, that is, cannot be held in closed position while a continued overload or short circuit exists on the line. The outdoor hand operated type breaker is shown in the accompanying illustrations. It is entirely self-contained, mounted on a substantial cast iron frame that can be set in any location and requires no foundation, bed plate, or base.

The fact that each pole is enclosed in a separate tank renders the inspection of the contact mechanism a very easy matter. The overload current transformers are mounted within the enclosing case of the breaker being thus pro-





tected from the weather and accidental contact with the operator. The leads from these transformers pass directly to the trip coils of the breaker which are also enclosed in the housing. Insulated leads are brought out through heavy corrugated porcelain bushings, as shown. Sight gauges are supplied on each coil tank for determining the height of the oil, and the tank is filled with the oil through a plug located just above the sight gauge. In the end of the housing is a hinged cast iron door fastened by means of a bolt and winged nut which permits ready access to the calibration mechanism. Leads for indicating lamps that show the position of the contacts are brought out on the under side of the case and may be carried to any convenient location for the lamps. A vent pipe with a double opening is attached to the top of the weather proof housing to permit the escape of gases arising at the time of the operation of the breaker under load. The housing is so constructed that it can easily be removed, permitting a ready inspection of all parts of the breaker; when assembled it forms an entirely waterproof compartment. All live metallic parts inside the case are well insulated and any danger of flashing from them to the case is eliminated.

The type B breaker, due to its rugged construction and ample proportions, is adapted to the control of circuits of moderate capacity and voltage in outdoor installations. In the number of installations where it has been used it is said to have successfully met the most severe conditions. It may well be claimed that the introduction of this outdoor apparatus marks the beginning of an important development in the sale of electrical energy, furnishing as it does, a means of supplying many small communities, and even individual consumers from transmission lines where the amount of revenue to be derived absolutely precludes the idea of a sub-station with its attendant expense.

The Atlas Crude-Oil Engine

The Atlas Engine Works of Indianapolis have issued a comprehensive bulletin describing the construction, operation, advantages. etc., of their crude-oil engines. Comparisons are made with steam power plants and with producer plants as to comparative fuel costs, operative costs, costs of installation &c. Attention is drawn to the mechanical efficiency of the crude-oil engine and its economy on light load, the efficiency being almost as great on quarter load as on full load. Attention is also drawn to the fact that the fuel-oil used is very cheap, that at the present time there is no other use for this oil which is a by-product in the manufacture of the better classes of oil, and that therefore, there is not much chance of an increase in price.

The Atlas crude-oil engines are of the Diesel type but differ from other types of oil or gas engine in that the ignition is by compression. There is no times, magneto, hot plate or other ignition device required, nor does it require a heater, vaporizer, carburetur or fuel mixer either to start or operate the engine. Pure air only is drawn into the cylinder on the first stroke. The second stroke compresses this air in a small space between the piston and the cylinder head to 500 lbs. pressure producing a temperature of 1,000° F. During the third stroke a jet of oil is sprayed into the cylinder thoroughly mixed with air at about 900 lbs. pressure. This is introduced gradually through a small nozzle at such a rate that the temperature and pressure during the combustion period remain practically constant.

In other types of oil or gas engine a more or less complete mixture of gas or fuel vapor with air is ignited and the flame spreads through the entire mass almost instantaneously, giving a sudden rise of pressure and temperature which causes an explosion. In the Atlas engine there is no explosion, but simply a burning of the gas.

The pressure and temperature in the cylinder never rises appreciably above that due to the compression of the air in the second stroke. It follows that the engine operates easily and without shock.

The fourth stroke clears the cylinder of the unburnt gases preparatory to the next four stroke cycle.

That the speed can be controlled very closely and that the variation in speed under changing load conditions is very small is showed by recent tests conducted by Mr. Sargent, consulting engineer, which showed the following variations: 10 per cent. overload to 90 per cent. load, .9 of a revolution; 10 per cent. overload to 58 per cent. load, 2.1 revolutions; 10 per cent. overload to 25 per cent. load, 3.7 revolutions; this latter is equivalent to only 2.11 per cent.

A Steel Mill's Electric Railway

The quick and economical transportation of material has long been a serious problem in many steel plants. The managers of the mills of the Superior Steel Company in Carnegie, Pa., have most efficiently solved this problem, and have recently completed the installation of a new system of transporting their steel and raw materials from one building to another and around the mills. Formerly this was done by means of the time honored trucks run over steel plates laid on the floors about the mills and hauled by men. To-day they have in successful operation a complete industrial railway system, including electric locomotives, cars, tracks, switches, etc., enabling them to quickly and easily haul materials to all parts of their plant.

This entire equipment was furnished by the Orenstein-Arthur Koppel Company of Pittsburg, and was built in their own plant at Koppel, Pa. The electric locomotives shown in the accompanying illustration, a view of the equipment in the Superior Steel Company plant, are operated by an overhead trolley, and are easily handled by one man. By the old method of hauling it required several men to handle each truck—to-day one man operates a whole train. The Steel Company think so well of their equipment that they have just recently ordered twenty-four additional cars. These will soon be delivered and will give ample facilities for handling all their products.

Electric Haulage in Superior Steel Plant

The managers of manufacturing plants are rapidly becoming aware of the fact that it is often possible to effect remarkable economy in their establishments by means of a modern system of transporting their materials. Even many of the smaller plants are finding in the industrial railway a more ready and convenient means of handling materials—a means that will save time and money. The industrial railway in its present high development makes possible a big reduction in the amount of labor needed in such handling.

A New Pole-Preserving Machine

The treatment of poles with preservative oils is receiving increasing attention by pole dealers and municipalities at the present time. On this account a new method of applying the preservative will be interesting to cedar pole men. It is a recognized fact that the point in the pole which causes the most trouble owing to decay is just at the ground line and the new method concentrates its oil treatment for a distance of 18 inches above and below the surface line of the earth.

An idea of the machine may be obtained from the accompanying illustration. The main parts of the machine are a steam boiler, air compressor and storage tank, a closed oil tank containing steam coils for heating the preserving oil and an air-tight canvas band three feet wide. This latter band is wrapped tightly around the pole at the zone to be treated, oil is inserted under it and pressure is exerted for such time as is required to drive the oil some distance into the wood.

Recent tests made showed that under an air pressure of about 5 lbs. per square inch heated creosoted oil with a ten minute treatment penetrated to a depth of three-sixteenths of an inch, which in the course of a few days had extended to one-half inch in depth. The three-foot length of pole during the ten-minute treatment absorbed a full gallon of oil.

Any kind of coal tar may be used. The capacity of the machine is about fifty poles per day. The cost of treating each pole, including labor, oil, fuel, and fixed charges on the machine, is less than $1 per pole.

This process of pole preservation has been patented by Mr. Geo. P. Benton and Mr. I. B. Eberhardt, the inventors, who, under the firm name of the B. & E. Pole Preserving Machine Company, Chicago, now manufacture this apparatus.

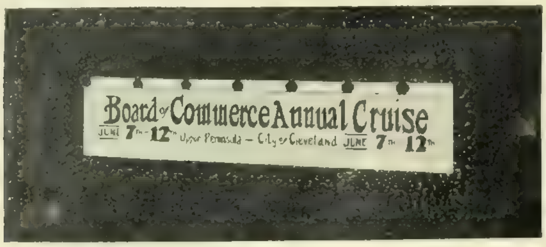
Will Handle French Tungstens

Mr. Julian Vos, recently of the Hydro-electric Power Commission, has established himself under the name of "American Electric Company," 14 King street east, Toronto, for the sale of the tungsten lamps manufactured by the General Electric Company of France.

Illuminated Billboards

The Reynolds Electric Flasher Manufacturing Company have perfected a new type of reflector for billboards, bulletins, walls and other non-illuminated signs of various descriptions. The illustration shows a night view of a bulletin board illuminated with mirror reflectors.

This differs from the average reflector in that the shape of the reflector is octagonal, which causes the light to be evenly diffused to every part of the sign or surface to be



lighted and the interior of the reflector is lined with mirror glass, which is found to be superior to enameled or painted reflectors.

Since the advent of tungsten lamps, there has been a considerable movement in favor of illuminated sign boards; progressive advertisers are demanding lighted bulletins, claiming that more good advertising results are obtained in a few hours by night than during the entire day. The illuminated billboard serves a double purpose, one that it permits night advertising, and the other that it helps light the sidewalk as well as street.

The Thordarson Toy Transformer

The Thordarson Electric Manufacturing Company, of 214 South Jefferson street, Chicago, Illinois, have added to their line of low voltage alternating current transformers, two new type toy transformers, viz:—No. 1A and No. 2A. These transformers as herein illustrated are equipped with binding posts for low voltage connections and are designed to meet the demand for a highly efficient, low priced transformer. They are identical in every respect with the standard No. 1 and No. 2, the only difference being in the way the secondary or low voltage terminals are made. The No. 1A has six secondary voltages and the No. 2A ten secondary voltages.

Toys and other miniature appliances that require less than 40 watts to operate, usually work as well on alternating current if the current is not over 60 cycle per sec-

ond, as on battery current. The distinct advantage of low voltage toy transformers over dry cells or storage batteries for miniature apparatus is readily appreciated by the consumer. On a transformer there is nothing to wear out for the reason that there are no moving parts. The transformer is assembled in a black enameled steel case and insulated in a hard moulding compound, making the whole construction rigid and durable. With reasonably fair usage it will last a lifetime. As an investment, nothing can be purchased for the money that covers as complete a field for the boy's study and experimentation as this little transformer. All transformers are equipped with a flexible connecting cord and attachment plug.

B. C. E. R. Co. Appointments

Mr. James Roosevelt has been appointed manager of the transportation and sales department, and assumed active charge of the duties of the office on October 6. The office covers a new field, including the supervision of the company's tram system, both urban and inter-urban, on the mainland of British Columbia and Vancouver Island, as well as control of the sale of light and power at all points in the company's territory. In the control of the operating department Mr. Roosevelt assumes the duties formerly performed by assistant general manager Glover, who was recently appointed general executive assistant of the company Mr. Roosevelt is a cousin of Col. Roosevelt, ex-president of the United States. He comes to the B. C. E. R. Co. from New York City, where he has been filling with great success the position of general superintendent of the Third Avenue railway.

Mr. S. B. Thompson has been appointed by the management of the company as mechanical superintendent. This is a new office in the division of the company's work, its creation having been demanded by the great advance of its activities caused by the rapid development now going on all over the territory it serves. Mr. Thompson will have supervision of the company's rolling stock and electrical equipment at all points on the British Columbia coast and Vancouver Island. He comes to Vancouver from New York city, where he has been in charge of the operating department of Sanderson & Porter, consulting engineers, for a number of years. Formerly he was connected with electric traction companies at Baltimore, Youngstown, O., and Anderson, Ind., as well as with several steam railways. He took over the duties of his new office on October 6.

29.3 Per Cent. Better than Formerly

The Canadian Carbon Company, formerly at No. 12 Shuter street, Toronto, make two important announcements. The first is that their business has expanded so rapidly that it has been necessary to remove to larger quarters, and that in future they will be found at 96 King street west, where they will have a factory building of their own in the rear. The second announcement is to the effect that after continued experiment they have succeeded in finding new ingredients for a high grade battery compound, which increases the endurance of their dry batteries by 29.3 per cent. They state that they absolutely guarantee their X cell and Flash Light batteries to be 29.3 per cent. better than any other batteries on the world's market.

Lindsley Bros. Open Calgary Office

The Lindsley Brothers Company of Spokane, Wash., pioneers in the western cedar pole industry, have found it necessary to open a Canadian office at Calgary, Alta. Mr. G. U. Bacon has been placed in charge of the new office as resident manager and will push the company's well-known "Pole-cat Brand" of cedar poles throughout Canada. The company is also adding to its line the "Bear Brand" of cedar posts.

This company's cedar pole yards are located at many points in Idaho, Montana, British Columbia and Washington. Their main yards in British Columbia are at Nakusp on Arrow Lake.

Current News and Notes

Amherst, N.S.
The Canada Car & Foundry Company are constructing new car shops here with a capacity of 100 cars per year. Building to be ready December 1st.

Beachville, Ont.
A vote was taken on October 20th giving authority to close a contract with the Hydro-electric Power Commission for 100 horse power. There will be two miles of high tension line required, together with a small sub-station, and the customary indoor equipment.
A by-law was submitted October 20 to the ratepayers for equipping a power station. The farmers throughout the district want power and will need electric and other equipment.

Berlin, Ont.
The council have decided to submit a by-law to the people asking power to expend $25,000 on the extension of their lighting system.

Brandon, Man.
The Goldie & McCulloch Company are installing a 32 and 50 x 36 cross-compound Corliss non-condensing engine, the exhaust steam for which is to be used for district steam heating, which has proven very satisfactory here in the past. Generator and switchboard are being installed by the Canadian General Electric Company to furnish additional power. Capacity of generators 2250 h.p.
The excavation and laying of steel on 10th street has commenced, under the supervision of the city engineer. It is not yet decided whether the franchise will be retained by the city or granted to a private party.

Calgary, Alta.
The by-law to expend $375,000 on street railway extensions was carried on October 3. It is not the intention to spend all this money immediately.
The Alberta Electric Railway Company have given notice that they will apply to Parliament for a charter amendment authorizing an increase in capital to $10,000,000 and a change in name to the Alberta Interurban Railway Co.
The gross earnings of the Calgary municipal railway for the month of September is $34,402, as compared with $19,239 a year ago.

Chelsea Green, Ont.
The municipality have decided to take hydro power from London and will install full equipment. 24 street lights will be put up and equipment for houses will be required.

Davidson, Sask.
Are installing a 36-brake horse power Daniels gas engine with producer plant. This engine is one that was exhibited at the Industrial Exhibition in Winnipeg the past summer, and excited very favorable comment. With this engine is a 30 kw., 2200 volt, 60 cycle, 3-phase belted generator and one panel switchboard. These are supplied by the Canadian Westinghouse Company. The distribution system is 2200 volts and stepped down to three-wire single-phase for lighting consumers. The machinery is on the ground and it is expected that the plant will be in operation in about six weeks. Mr. C. F. Publow is superintendent of the electric light plant

Drummondville, Que.
Tenders are called until October 23 for power equipment, including a 250 h.p. water wheel and a 150 kw. generator. Tenders addressed to town secretary, D. A. Moisan.

Edmonds, B.C.
The engineer has recommended to the council that about 119 lights be located in various parts of the municipality. The report was adopted.

Fredericton, N.B.
J. B. McRae, consulting engineer, Ottawa, has been appointed by the Provincial Government to make a report on the power available for electric generation at the Meductic Falls on the St. John river, about forty miles above this city. No development work has yet been done by the Eel River Power Co., which proposes to bring power to Fredericton, Woodstock, St. Stephen and McAdam. Surveys have been made, however, and it is said the work will be pushed forward early next year.

Fort Francis, Ont.
The council have decided to extend the electric light system in the west end of the town.

Galt, Ont.
A meeting was recently held here, at which Engineer Sothman was present, in which the question of pumping the town's water supply by a centrifugal pump operated by motor power was discussed. In all probability Mr. Sothman's suggestions will be followed but in the meantime members of the waterworks commission will visit towns where similar systems are in operation.

Hamilton, Ont.
Engineer Sifton is preparing plans for two transformer stations, for municipal electrical system.

Innisfail, Alta.
Plans will shortly be submitted for the establishment of an electric light plant in this village. It is believed that with 1,000 lamps in operation the plant would be self-sustaining. It is estimated that the plant can be installed for $15,000. By-law carried by large majority.

Kamloops, B.C.
A by-law will probably be submitted in the near future for the development of about 2,000 horse power of electric energy at the Barrier river, at a cost of approximately $190,000. A pumping outfit will likely also be installed at the same time. Dutcher and Maxwell, Vancouver, are consulting engineers.

Lethbridge, Alta.
Plans and specifications for the proposed extensions to the city power plant have been sent out by the engineering department to a number of large firms. Three alternatives are given in the specifications, and the city will not decide which plan to folow until all the tenders are received. The extensions are necessary for the operation of Lethbridge's new street railway.
Plans are being prepared for adding another 1,000 kilowatt unit to the municipal steam generating plant.

Lindsay, Ont.
The by-law to grant a franchise to The Electric Power Co., Ltd., was carried by a majority of 606.

London, Ont.
The water commissioners are surveying for a new driveway between London and Springbank. Electric lights for four miles will be required. Work will be done next spring.
It is proposed to increase the capital of the London Street Railway Company by $1,000,000.
It is said the London Street Railway Company will shortly discuss the question of purchasing equipment for power house, extension of lines and purchase of more cars. Mr. C. B. King is manager.
As a result of charges that Niagara power was being sold in this city below cost the government sent an auditor to look over the accounts. The result is said to show that the distribution is already on a paying basis. A statement will be issued to the citizens by the water commissioners.

Melville, Sask.
The Brydges Engineering & Supply Company are installing two 80 brake-horse-power Daniels gas producer plants with engines and two 50 kw. Swedish General Electric generators. This plant also includes the town water works and air lift system. Air is supplied by air compressor, Canadian and Rand make, driven by a 25 h.p., 2200 volt, three-phase, 60 cycle motor. There are also two Escher-Wyss turbine pumps driven by 40 h.p. motors. They expect to have twenty-four hour service. C. R. Heath is town engineer, and Enoch Smith is electrical engineer. The electrical apparatus is being supplied by Messrs. Kilmer Pullen & Burnham, Toronto.

Mimico, Ont.
The council of Mimico has decided to sign a contract with the Hydro-electric Power Commission. The cost for 25 h.p. is quoted at $31.50. The Erindale Power Company state that they will compete for the sale of power and will offer a $25 rate.

Moncton, N.B.
Good progress is being made installing the extensions to the railway system. Dr. A. L. Henderson, president of the Moncton Tramways Company, and Mr. E. A. Mitchell, consulting engineer, are on the ground and state that the cars will be running on the date specified in the agreement.

Montreal, Que.
Under the name of the Montreal Tramways Company, the Montreal Street Railway, the Montreal Park and Island Railway, the Montreal Terminal Railway, and the Montreal Public Service Corporation have been merged into one system.

Nanaimo, B.C.

Mr. S. J. Haffner, of Victoria, will ask the council for a franchise to build an electric railway to serve this city and surrounding districts.

Niagara Falls, Ont.

The newspaper reports of a proposed system of illumination for the boulevard from Niagara Falls to Fort Erie b-- the Queen Victoria Park Commission are not correct and we understand the matter is not being discussed at present.

North Bay, Ont.

A shortage of power here, caused by low water at the Nipissing Power Co.'s plant, South River, is believed to be originally traceable to Beaver dams in Algonquin Park, where the head waters of South river are located. It is understood the company have made application to the Ontario Government for special permission to destroy these dams.

North Toronto, Ont.

It is said that legal steps will be taken by the Interurban Electric Company to annul the agreement recently entered into by the town of North Toronto with the hydro-electric department of Toronto on the ground s that the Interurban Company has an exclusive franchise and also that the city department has no power to do business outside the city limits.

Engineer E. A. James has reported on the cost of constructing a street car line connecting with the new Rosedale extention at Summerhill ave., running up the new road which is being opened through Mount Pleasant Cemetery across to Avenue road and down to St. Clair avenue. The cost is considered prohibitive at the present time but it is possible that part of the road will be constructed in the near future.

Ottawa, Ont.

It is reported by general manager A. A. Dion, of the Ottawa Electric Company, that there is very little interest taken in the privilege allowed their customers of changing over from the former meter rate to the new system of payment by area, which is being used entirely by the city authorities. It will be remembered that the Ottawa Electric Company allowed their customers the privilege of using either system in order that there should be no misunderstanding about the measurement of the houses the company will use the figures obtained by the city.

A ten per cent. call has been made on the subscribed capital of the Morrisburg and Ottawa Electric Railway Company, payable on or before October 13.

Victoria Island, close to Chats Falls, a valuable water power on the Ottawa river, thirty miles up-stream from Ottawa, is said to have been sold to Mr. D. O'Connor. This is understood to be a purchase for the Hon. Mr. Harty, owner of Chats Falls. The island in itself has no great value, but from a strategic point of view it would be very valuable in the development of the water power.

Peterborough, Ont.

Extensions will likely be made to the Peterborough Radial Railway system, commencing at the C. G. E. gates, along Albert street to Lafayette ave., along that street to Chamberlain and down Chamberlain to the C. P. R. tracks.

Prince Rupert, B.C.

Engineer Ross, Seattle, has recommended the purchase of two Ridgeway units to cost $14,590. Delivery to be made in December.

Regina, Sask.

The new unit which is being added at the electric power station should be ready for operation around the first of November.

Renfrew, Ont.

Owing to a shortage of power the town has decided to loan electric generators and steam engine now on hand to the extent of about 300 horse power, to the Renfrew Power Company. This offer, if accepted, will supply the present needs of the town and enable not only the power and lighting customers to be served, but also will supply sufficient power to the water pumping plant.

Ridgetown, Ont.

This town is taking steps with a view to buying out the local electric light plant and operating it in connection with the waterworks system.

Rouleau, Sask.

A by-law to raise $15,000 for power purposes will be submitted shortly.

Saskatoon, Sask.

It is reported that the extensions to the new electric generating plant will be completed about the end of November. The new plant will have a present capacity of about 2,000 horse power, but is being constructed so as to be easily extended to an 8,000 horse-power capacity. Superintendent Sangster is in charge of the extensions.

St. Alban, P.Q.

Contractors, Limited, of 204 St. James street, Montreal, have secured a contract from the Deschambeault Electric Company for a power house, forebay, concrete walls and installation of electrical machinery and transmission lines. The works are to be built on St. Anne's river at a cost of $200,000, and are required for power and lighting purposes. The contract is to be completed by next summer.

St. Mary's, Ont.

A by-law to raise $15,000 for extension of the hydro-electric system carried by a good majority.

St. Thomas, Ont.

It is said the General Gasoline Electric Motor Company of New York, will establish a branch factory here.

Work on a new line from St. Thomas to Port Stanley will be rushed and it is expected to be completed in a few weeks.

Stratford, Ont.

The Stratford Railway Company has asked and has been granted an extension of time for commencing the construction of their electric street railway here until May 1st, 1912. Six months' time is then granted for the completion of the road, which is to be in operation on November 1st, 1912. It is said that capitalists from Cleveland have been interested in the road and are willing to finance it next summer.

Strathroy, Ont.

Mayor Geddes and a special committee have been appointed to make a thorough investigation into the electric lighting and waterworks plans to find if repairs are necessary.

Thamesford, Ont.

A transformer and full lighting equipment is required. The village will take 600 h.p. from the commission and intends to supply Kintore village.

Three Rivers, Que.

By a good majority, the by-law to install a street railway in this city, carried.

Toronto, Ont.

The contract with the Toronto Electric Light Company for lighting the streets of the city expires on November 1st, after which date the city will be lighted exclusively by the new municipal plant.

The dispute between the Toronto and Niagara Power Company, and the town of North Toronto, which arose over the constructoin of a transmission pole line on Eglinton avenue, which is to cross Yonge street, and for which consent had not been asked from the town of North Toronto, has been decided in favor of the company. The construction work was delayed for some time on the plea that the town had the right to decide where these poles should be placed, but judgment was finally given by Chancellor Boyd, to the effect that the charter allows the company to erect its poles without consulting the municipality through which it passes. The decision will be appealed, it is said, by the town authorities.

A question of whether the suburban railway service through North Toronto shall be improved by the installation of additional long switches or by the construction of a double track line throughout has been discussed before the Ontario Railway and Municipal Board. The company believes that the laying of switches will be sufficient and proposes to build a private right-of-way at the south end of Yonge street parallel to and about 200 feet to the west of that street. The city of Toronto and the town of North Toronto object to the private right-of-way as creating a number of level crossings and also as likely to depreciate materially the value of property in this vicinity. Latterly they suggest the widening of Yonge street, the double tracking of the system and the building of a tube railway to connect with it, which will allow an entrance to the centre and southern end of the city. The board has disagreed on the question and the town is undecided what steps to take.

On such residential streets as the more elaborate ornamental standards are required for their lighting these are being installed by the city hydro-electric department and the expense charged to the ratepapers along that street. The cost has been placed at $2.50 per foot frontage but the condition is made that a reduction will be allowed if the actual cost proves to be less than this amount. It has been said that the actual cost will not exceed $1.25 per foot.

Some months ago the Toronto Railway Company promised to have 100 new cars and a number of extensions to the railway lines finished during the present year. As far as the company has been able to fulfil its promise this has apparently been done; the new cars are nearly all completed and some of the new lines are already in operation. Manager Fleming complains, however, that the work has been delayed by the city authorities who prepare the road bed in preparation for the company's track laying.

The Ontario Railway and Municipal Board has issued an order for approval of the town of Ingersoll's by-law to raise $25,000 for the extension of its hydro-electric distribution plant. The Huronian Company has filed application with the board to which the township of McKim and the Chelmsford Telephone Company are made parties for approval of the Huronian Company's power transmission line.

On the ground that the Ontario Railway and Municipal Board has no jurisdiction to decide whether the city of Toronto shall have running rights over its lines, the Toronto Railway Company has filed its reasons for an appeal against the board's decision.

The Ontario Railway and Municipal Board has granted the Toronto and York Radial Company permission to deviate tracks from Yonge street between Farnham avenue and C. P. R. crossing along private right-of-way. It is not yet decided whether the crossings shall be level, underground or overhead, but Engineer Wyse will report on cost of each.

Union, Ont.

Hydro-electric equipment and lights for the village required.

Vancouver, B.C.

It is hoped that the Western Canada Power Company will be ready to deliver power in Vancouver from their hydro-electric plant at Stave Lake by the first of December.

The Canadian Pacific Railway management are said to have acquired a water power on the Adams river which flows into the south Thompson river near the west end of the Shuswap Lake. The Adams river is said to be capable of developing 100,000 h.p. at two points. This would seem to bring the electrification of the C. P. R. to the mountain district one step nearer.

The city council originally intended to bear only one-eighth of the annual lighting expenses on those business streets which are equipped with ornamental standards. It is now said that the cost of lighting has been found to be heavier than with the arc system, thus entailing a heavier burden on the property owners, and it is now proposed by the city to assume one-quarter of the cost.

City Electrician McCrossan has called for tenders for the supply of 250 street-lighting standards and a quantity of conduit.

Vermilion, Alta.

Tenders were called to October 16th for a 75 horse-power steam engine and boiler and a 50 kw. a.c. generator with corresponding switchboard apparatus. Messrs. Bowring & Logan, Toronto, are engineers.

Vernon, B.C.

The Corporation of Vernon are calling for tenders for a supply of a.c. watt-meters for a period of one year from November 1, 1911.

Walkerville, Ont.

The council has granted permission to the Sandwich, Windsor and Amherstburg Railway to lay a double track on Sandwich street from Victoria road to the western town limit.

The town council objects to the inauguration of the pay-as-you-enter system which Manager Anderson of the street railway system proposed installing.

Welland, Ont.

The first spike in the new electric railway was driven by Mayor Sutherland on October 4th. Work is being rushed but it is difficult to secure enough laborers.

Windsor Mills, P.Q.

The corporation of Windsor Mills is calling for tenders for three-phase, sixty cycle apparatus to replace their present equipment of 125 cycle, single phase. Improvements on the hydraulic end are also to be carried out to permit of a higher capacity of the plant. This latter work will be done locally. Mr. M. A. Sammett, of Montreal, is the consulting engineer for the corporation.

Winnipeg, Man.

The Board of Control, M. Peterson, secretary, are asking tenders on a supply of carbon and tungsten lamps. Specifications, etc., at the office of the city light and power department, Main street, Winnipeg.

Some time ago Mr. Chas. Chamberlain, of the Great Falls Power Company, made an offer to the city of Winnipeg of $10 per horse power, for a block of 20,000 horse power. The city's reply is that they would be willing to supply an unstated amount, delivered at the city limits, at a flat rate of $20 per h.p.

Provision will be made in the estimates of the telephone department for the coming year for a couple of branch exchanges. These will probably be established at Norwood, and on the Groat estate.

Following the failure of the city to accept Mr. MacKenzie's offer to buy out the entire street railway interests for the sum of about $24,000,000 negotiations are now said to be under way with a syndicate headed by Mr. F. Morton Morse, at present secretary, and also a director of the Winnipeg Railway Company. It is also said that this syndicate will be willing to pay a considerable higher price than the city was asked.

Condensed Department

RATES

Positions Wanted, Positions Vacant, Miscellaneous: 2 cents a word and 25 cents for a heading, per insertion.

Tender advertisements, equipment for sale, etc., 15 cents per agate line (14 agate lines make one inch) per insertion.

Advertisers who wish to conceal their identity may do so by using an Electrical News box number without extra charge.

Forms close on the 18th of each month.

Situation Wanted

Experienced man, at present employed, wants executive position with light and power company. Good organizer, hustler, and used to handling men. Could institute and look after new business department. Best of reasons for wanting to change. Box 342, Electrical News, Toronto, Ont. (41-41)

Wanted
Induction Motor

WANTED—To purchase a second hand 15 or 20 h.p. Induction Motor, 3 phase, 60 cycles, 220 or 550 volts. Must be in good condition. Give maker's name and details.

Canadian Moloney Electric Company, Ltd.,
Windsor, Ont.

Tenders for
Street Railway Supplies

Sealed tenders marked "Tender for Street Railway Supplies," addressed to the City Commissioners, Calgary, Alta., will be received up to 12 o'clock noon, November 15, 1911, for the supply and delivery of the following street railway material, via lake and rail or all rail:

Track

26,000 standard 6 x 7 in tamarac ties.
300 tons 6 in. high T. 60 ft No. 60 rails,
800 tons A.S.C.B. standard 60 ft. No. 60 rails; or their equivalent in A.S.C.E. 60, 30 or 33 ft. rails with necessary angles, bolts, etc. quoted separate.
15,000 lbs. 5½ x 9-16 in. track spikes.
3 double 3 part Y branch off with crossings.
1 double track, left hand branch off.
6 standard A.S.C.E. ordinary T rail spring tongue switch.
6 standard A.S.C.E. ordinary T rail solid mates.
6 standard A.S.C.E. ordinary T rail frogs filled.
3,200 10 in. bonds, 7/8 in. plug, flexible, 4/o.
2,500 13 in. bonds, 7/8 in. plug, flexible, 4/o.

Line Material

250 wood poles, 6-in top, 12-in. butt, not over 4 in. def. 30 ft. standard spec.
250 wood poles, 8 in. top, 12-in. butt, not over 4 in. def. 35 ft. standard spec.
Tenders will also be considered on 30-ft. poles 7-in. tops 10-in. butts, and 35-ft. poles 8-in. tops, 10-in butts. All to be peeled.
80 steel poles 28 ft. long, maximum load 1000 lbs.
20 steel poles 30 ft. long, maximum load 1000 lbs.
18,000 ft. 500 M.C.M. 600-volt conduit cable (Underground).
30,000 lbs. 2-0 trolley wire, round.
7,000 lbs. 5-16 single galvanized soft steel span wire.
1,200 ⅝ eye bolts galvanized.
400 9 in., 400 10 in., 400 12 in.
1,200 wood strain insulators 1-in. galvanized.
500 standard strain insulators 2-in
100 standard strain insulators 2½-in
800 straight line hangers one piece, galvanized, round top ⅝ stud
1,200 straight line clips 12-in for. 2-0 trolley (clinch).
300 double curve cap and cone pullovers, galvanized, comp.
300 single curve and cone pullovers, galvanized, comp.
25 R. H. trolley frogs, malleable.
25 L. H. trolley frogs, malleable.
12 right angle cross overs.
20 adjustable crossovers.
10 rigid crossings.
25 feeder hangers, O. B. 2417 or similar.
12 section insulators, 2-0 round wire.
6 Y-trolley frogs.
36 metropolitan strain plates, galvanized.
36 metropolitan strain ears.
10 200 amp. section switches, with boxes.

Each tender must specify clearly the capacity and type of article quoted on with full specifications.

For further information or paticulars, before submitting tenders, address City Commissioners.

W. D. SPENCE,
City Clerk.

42-41

Electrical News

Generation Transmission and Application of Electricity

PUBLISHED MONTHLY BY

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ADVERTISEMENTS.

Orders for advertising should reach the office of publication not later than the 20th day of the month preceding date of issue. Changes in advertisements will be made whenever desired, without cost to the advertiser.

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Correspondence is invited upon all topics coming legitimately within the scope of this journal. Subscribers can materially assist by sending in news items and information regarding electrical development in all parts of Canada.

Vol. 21 Toronto, December, 1911 No. 12

The Two Extremes

The new leader of the Liberal party in Ontario has taken occasion to express himself on one or two matters in which electrical men are especially interested. Speaking for his party he is reported to have pledged his support to the public ownership and operation of public utilities, and especially in the matter of the utilization of water-powers throughout the province for the generation and distribution of electricity. He also takes occasion to commit himself as being in favor of the acquisition and operation of telephone lines, though his pronouncement in this connection takes less definite form than could have been wished. Another pronouncement, and on this he will doubtless be commended, shows his favorable attitude towards the enlargement of the powers of the Ontario Railway and Municipal Board. It is believed that not only should these powers be much wider, but that the board should be reorganized so as to render it a more influential and effective tribunal in the public interest.

It is evident that Mr. Rowell has no intention of setting himself in opposition to the power policy pursued by the Conservative Government in organizing and carrying through its large electrical distribution system throughout Southwestern Ontario; no doubt believing that with the present general feeling on the question of public ownership it would be political suicide to do so. The new leader, however, would apparently be well advised in thoroughly investigating the conditions before advocating a similar arrangement in Ontario in connection with telephones. Most of us remember distinctly the local rejoicing that followed the announcement of such a step in Manitoba, where cheaper telephones and better service were promised. To date, so far as we can learn, there is no evidence that these promises have been fulfilled, and, indeed, we need go no further than the latest report of Commissioner Patterson, showing that the present year's deficit on the Manitoba telephone system will be $150,000. We are informed that this deficit is not the result of a reduction in rates since the system was taken over by the government.

The cause of municipal ownership, so far as telephones are concerned, gets a distinct set-back from the announcement that the rates in Manitoba will be increased. We have no reason for believing that the management in Manitoba has been at fault. The result simply bears out the argument that municipal management is not likely to be so efficient as private management.

It yet remains to be shown that municipal operations in Canada are, in general, a success. Such full sounding expressions as "Municipal Ownership of Public Utilities" are fine things to thrill a mass meeting of voters with, at election times. Yet it is safe to say that less than ten per cent. of our voters sit down and count the cost or calculate the probable advantages of the policy for which they now clamour so loudly. A factor that plays an infinitely larger part in forming the decision of the average ratepayer is his hatred of wealthy corporations. If the actual facts of many of to-day's municipal enterprises could be unearthed there are enough political intrigues, enough extravagant expenditures, enough mistakes in judgment, enough deliberate attempts to keep the taxpayers in the dark as to the real condition of affairs, to reverse the tide of public opinion. But, perhaps these things are better not known.

It is interesting to analyze the causes that have been most prominent in producing the present attitude of the public towards public ownership. There appear to be four main causes:

1. The human characteristic aversion we all have to seeing any one else with more than we have ourselves. This applies especially to wealth which means luxury and power.

2. The undoubted and indefensible arrogance of some of the wealthy private corporations which control our public utilities. This is the result chiefly of—

3. Improper franchises which give the private corporations more power than they have any right to. This, again, is the result of—

4. Incompetent municipal officers who were no match, on a keen business transaction, for the private corporation.

This latter cause, generally recognized, is sufficient answer in itself as to the relative efficiency of the management of a utility by a company or a municipality. If a company is more shrewd at bargaining, will it not also be more shrewd in its business management? The fact is, the corporate company is an aggregation of specialists trained in the efficient organization and management of the business it is engaged in. A municipality is lacking in this training. Further, there is a lack of continuity in the officers; there are also the exigencies of re-election.

Summed up, the strength of municipal ownership is private corporation arrogance; its weakness is municipal incompetence and political interference. There are unmistakable signs that the private corporations have profited by their experience and in many cases have learned to treat the public justly and even generously. This is coming to be recognized as modern business methods. There are also signs, equally unmistakable, that much of the glamour of municipal ownership has been dispelled, in many quarters, by a few years of actual experience. Either extreme is unsatisfactory, and it is reasonable to expect that in the adjustment of the present chaotic conditions, a sane average

will be struck which will bring us a little nearer the ideal, when our public utilities will be owned and operated by a private corporation under such conditions that the public is fully protected. This is by no means an impossibility, for, as we have said before, the Consumers Gas Company of Toronto, privately owned and operated, yet so franchised and controlled by the city that the customers benefit largely from the company's prosperity, is "it."

Electric Christmas Shopping

Following enquiries from two or three of our readers as to the best class of electrical material to stock for the Christmas trade the question has been raised whether the central stations in general and the retail dealers pay sufficient attention to the distribution of electrical matter at the Christmas season. There is no disputing the fact that a lot of good money is spent at Christmas and New Years on small priced articles ranging (say) from \$1.00 to \$25. This being so, there does not seem to be any reason why electrical apparatus should not occupy a relatively more important place among Christmas and New Years presents. There is more than one reason why this should be the case. To begin with, the majority of low priced electrical apparatus is far more useful than the average gift. Added to this is the fact that the electrical gift is generally well constructed and designed to last for a number of years, as compared with flimsy temporary articles or toys of other kinds. There is also the educative value to be considered. Last, and perhaps not least from the central station view point, is the fact that they consume current not only at Christmas time but, if they are used, all the year round, and so become a continuous source of revenue. We believe that the sale of electrical apparatus at this time of the year has not been so vigorously advanced as it might well have been, and that purchasers have not had the advantages of electrical toys, novelties, luxuries and so on sufficiently clearly placed before them.

It is unnecessary here to repeat the numerous utilitarian articles that are to be found on many of the counters of electrical retail houses but two or three things of special interest have been brought to our notice recently. One of these is a type of present, dear to the heart of every school boy, consisting of passenger cars, locomotives, freight cars, &c., all motor driven. Another one equally calculated to give pleasure at this joyous season is a small projection lantern which can be purchased for a few dollars and will reproduce on a small screen images of post cards or books or any other article that it may be desired to enlarge. These are only two examples but they point the moral that in the present age there are numerous electric toys which are not only as attractive as the old fashioned mechanical toy but have the added value that they are permanent, enjoyable and intensely instructive in their operation.

Canadian Committee Meeting of I. E. C.

A meeting of the Canadian Committee of the International Electrotechnical Commission was held in the Electrical Standards Labratory at Ottawa on October 21st last, at which were present: Prof. Herdt. in the chair, Prof. Barnes, Prof. Gill, Messrs. O. Higman, A. B. Lambe, J. Murphy, Prof. Rosebrugh and Mr. J. J. Wright. Such a large meeting, attended by the majority of those present at considerable inconvenience and personal cost, is good evidence that the Canadian Committee is making every effort to do its share in advancing the work of the Commission.

The main business before the meeting was Prof. Gill's report upon the recent International Congress at Turin, Italy, which he attended as the Canadian delegate. This report will be found in detail on another page of this issue of the Electrical News, and it will be seen that the Conference made several decided steps towards standardizing electrical practice throughout the world, chief among these being the adoption of symbols for current, resistance, and voltage, and the fixing of a standard direction of rotation for vector diagrams. The report was discussed at length by the Committee, who finally, at the suggestion of Prof. Gill, appointed a sub-committee, consisting of Messrs. Wright, (chairman), Duff, Kynoch, and Murphy, to report on behalf of the Canadian Committee. on the standardization of international rules for the rating and testing of electrical machinery. The basis of the sub-committee's work will be publication No. 9 of the Commission, being a compilation of the various rules now standard in different countries such as England, Germany, Sweden, United States, etc.

At the request of Mr. Higman, who in his capacity of chief engineer of the Department of Inland Revenue, contemplates a revision of the Electrical Units Act in order to bring it up to date, another sub-committee, consisting of Professors Barnes, Gill, and Rosebrugh. with Mr. Higman as chairman, was appointed to consider the question of electric and magnetic units. A third sub-committee, consisting of Prof. Herdt, chairman, and Messrs. Higman, Lambe, and Murphy, was appointed to report upon the local rules of the Canadian committe.

The next International Congress is to be held in Berlin, Germany, in 1913, and after that one will probably be called for 1915 in San Francisco, Cal., this latter in conjunction with an International Congress of Applied Electricity. In connection with the 1915 meeting it is significant that the I. E. C. should be asked by the Applied Electricity Congress, which met at Turin at the same time as the I. E. C. to take charge of the organization of future Applied Electricity Congresses. This was no doubt due to a feeling on the part of such bodies as the Italian, British, German and United States Institutions of Electrical Engineers, which along with other kindred societies, constitute the Applied Electricity Congresses, that a body having the world-wide standing possessed by the I. E. C. is in a better position to handle such matters than any local organizations.

The Committee meeting closed with a resolution of thanks to those who had lately contributed to the funds of the Canadian committee, namely, the Canadian General Electric Company, the Canadian Society of Civil Engineers, the Canadian Westinghouse Company, and the Department of Inland Revenue, as the Committee has been entirely dependent upon their great generosity for funds wherewith to meet its obligations, chief among which are the annual fee of \$250.00 which each committee pays to the Commission office in London, England, and the expenses of a Canadian delegate to the International Congresses.

Vancouver Section of A. I. E. E.

A local section of the American Institute of Electrical Engineers has been organized in Vancouver with all the important electrical interests of the city represented. The following officers were elected for the season of 1911-1912:—Chairman, F. D. Nims (Western Power Company); secretary, E. M. Breed (Allis-Chalmers-Bullock Company); executive committee, F. D. Nims, E. M. Breed, J. R. Read, L. G. Robinson, A. C. Routh. The speakers emphasized the necessity of co-operation among electrical engineers in British Columbia, where the opportunities and prospects for electrical development were possibly the largest of any locality in America.

The Electrical Page

An idea which seems to possess much good value has been put into practice recently in some of the larger cities of the United States by the electrical job houses that advertise for retail trade. In the past this advertising has been more or less hap-hazard; the place occupied by these small advertisers has been very small and it would be almost a matter of surprise if the advertisement should attract any attention whatever. The new idea consists in concentrating all the electrical advertisements on one page, or on one part of the same page. This page has been given the name the "electrical page" and readers soon get into the habit of looking for that particular page if they want any information as to the purchase of electrical apparatus. This innovation has been very fruitful of results and appeals to us as the proper way for retail men to advertise their small wares. To distribute these small items over 16, or 18, or 24 large pages of general reading matter is about as sensible as it would be to distribute the news of the stock market or of the cattle market, or any other classified information in the same way.

Hydro-Electric Power for St. John, N.B.

Some time ago the Common Council of the city of St. John appointed a special committee to look into the application of the New Brunswick Electric Company for entrance to the city to engage in a power and light business. After careful consideration a number of changes are suggested in the proposed charter. One of the recommendations is that the franchise should be a limited one, not over fifty years. Another suggestion is that the right to do business in the city, if granted to this company, should not be considered an exclusive one. The right is claimed on the part of the city to have the rates revised at any time by the Public Utilities Commission. The following scale of rates for power is mentioned as the maximum that the company should be permitted to charge: 5 h.p. or less, $65 per h.p. per annum for a 10-hour day; from 5 to 25 h.p., $50; from 25 to 50, $45; from 50 to 100, $42.50; from 100 to 200, $40; from 200 up $37.50. The scale for house lighting, electric signs, hotels, etc., should not be in excess of the following: up to 1,000 kw. hrs., 13½c. per kw.h., 25 per cent. discount; above 1,000 kw.h., 10c. per kw.h., 25 per cent. discount.

The intention of this company is to develop the water-powers of the Lepreaux and Magaguadavic rivers.

A later advice states that the Inglewood Pulp & Paper Company, of Musquash, N.B., have written the city council of St. John that it is their intention to develop a power at Musquash and they ask that they be given equal rights with any other developing company. This company calculates that it can develop 4,000 h.p. The suggestion has been made that the city should purchase this latter power, install machinery, and operate it as a municipal enterprise.

Dam No. 5, Trent Valley

The work of construction which has been progressing at dam No. 2 on the Trent River, 2 miles north of Trenton, Ont., has just been completed and the plant placed in successful operation. The electrical equipment consists of four 750 kw. units, giving a total normal capacity of 4,000 h.p., capable of continuously developing 5,000 h.p.

Work has also been commenced on the construction of another power house, at dam No. 5, at Frankford, which is about 3 miles farther north on the Trent River and it is expected that this station will be opened early next summer.

Only one step-up transforming station will be required for these two plants and this has already been built and is in operation at dam No. 2. When the plant at dam No. 5 is completed it will be connected by a 6,600 volt line (generator voltage) with the transformer station at dam No. 2, which has a capacity sufficient to step up the power from both development stations to 44,000 volts for distribution over the lines of the Electric Power Company's system.

The equipment at dam No. 5 will consist of four 650 kw. (at 80 per cent. p.f.) 60 cycle, 6,600 volt, 112½ r.p.m., vertical shaft generators, driven by a double runner turbine of 1200 h.p. maximum capacity each. The fall at this point is 18 feet. The exciter equipment will consist of one turbine driven and one motor driven generator.

We understand that the power from this station will be required as soon as, or even before the work can be completed, on account of quite unexpected development during the past year or two in the load on the Electric Power Company's system. Before the end of November it is expected that the new sub-station at the Canada Cement Company's Belleville mill will be in operation, which will require an additional 1,000 h.p. It will be remembered that this cement company already utilizes 3,000 h.p. in their Lehigh mill, which will now bring their requirements up to 4,000 h.p. Additional power will also be required by the Northumberland Pulp Company, at Campbellford, where a 1,000 h.p. motor for driving two 3-pocket grinders, together with a number of smaller motors, will bring the added requirements up to 1,200 h.p. before the end of the year.

The turbines for dam No. 5 will be furnished by the Canadian Boving Company, and the generators by Messrs. Kilmer, Pullen & Burnham, representing the Swedish General Electric Company. This plant will be practically identical with that of the Sidney Power Company's plant at dam No. 2.

Universal Transmission

A new device has recently been invented known as "Universal Transmission" by which it is possible to transmit power from one form of apparatus such as a motor, steam engine, or other form of prime mover capable of revolving an axis, to another apparatus in the immediate neighborhood of the first. The value of this transmission scheme lies in the fact that it is very efficient, that revolution in either direction may be obtained although the prime mover revolves continuously in the same direction, and that any required part of the energy of the prime mover may be utilized, at will, without steps or abrupt gradation.

The universal transmission apparatus consists of two revolving parts each operating on a longitudinal axis, though these axes need not necessarily be in the same straight line. In each half or part of the system are a number of pistons and cylinders placed cylindrically around the main axis and parallel to it so that all the pistons when operating move back and forth in a direction parallel to this main axis. The heads of the piston rods are held in what is described as a head-plate through the centre of which the main axis passes. The head-plate in each case is normally at right angles to the main axis but may be tilted at any angle to it by a simple adjustment.

Each part of this apparatus, which is enclosed in a stout metallic casing, revolves in oil which occupies all the space inside the metallic casing not taken up by metal. The two parts of the apparatus are separated by a mid-plate through which two passages on opposite sides of the plate connect the two halves of the system. If when the head-plate is at right angles to its axis, either main axis revolves, there is no motion of the pistons in their cylinders. If however,

the head-plate is slightly tilted this causes the pistons to work as the head-plate revolves which sets up a current in the oil from one half of the system to the other half through the passages in the mid-plate. This current produced by the pistons operating in one end causes the pistons in the other end to operate in unison, which in turn produces a revolving motion. The amount of energy transmitted in this manner depends on the angle at which the head-plate is held. Also by simply reversing the angle the second end is made to rotate in the opposite direction.

The scheme as yet is limited in its application and is specially designed for turret and gun control in naval work. A more general application may easily follow its success along these lines. The apparatus is being manufactured by the Universal Transmission, Limited, of New York.

Growth of Power Distribution in Central Ontario

The last year has witnessed a wonderful increase in the use of electric power throughout Central Ontario following the active operations of the Electric Power Company, in combining a number of smaller operating companies which have been placed under one management, interconnected with one another by high tension transmission lines so that they are now in a position to receive continuous power and light practically guaranteed against any contingency. On October 28, 1911, the output of the Electric Power Company's system reached the maximum figure of 6,431 kilowatts. This is easily more than double the load of a year ago. A very noticeable feature of this system is the high load factor maintained, somewhat over .90, a record which it would be impossible to equal in any kind of an isolated system. This high load factor is accounted for by the fact that several of the most important power users operate 24 hours a day, among the more important customers being the Canada Cement Company, of Belleville, Nichols Chemical Company, Sulphide, and the Deloro Mining and Reduction Company. An unusually high power factor of something over 90 per cent. is also maintained. This is kept up by the use of synchronous motors installed and operated by the more important customers in consideration of more favorable power rates. The total number of 44,000 volt sub-stations now operating on this system is 16, which will be increased by the addition of three more with the new year. The total rated capacity of the generating power is probably as high as 9,000 kilowatts normal rating including the two new units at Auburn dam, which will be in service almost immediately.

The Sarnia Arbitration

Acting under the Conmee Act the town of Sarnia and the Sarnia Gas and Electric Company have arranged whereby the value of the company's plant shall be arbitrated. Following this arbitration it is the intention of the town council to again make an offer to the private company, which if refused will open the way for the establishment of a competitive municipal plant. The Board of Arbitration is composed of Solicitor Weir of Sarnia for the town, H. H. Macrae, Toronto, for the company, and Judge Coulter, of St. Thomas. A. L. Mudge, of Smith, Kerry & Chace, Toronto, and E. J. Philip, Berlin, have been retained as experts by the town. The next meeting of the Board will be on December 18th.

As a result of alleged poor service on the part of the Bell Telephone Company in Owen Sound the purchase of the company's system by the town is being discussed.

Planing Mill Electrification

The latest addition to the list of electrically operated wood-working plants in the Canadian West is the mill and box factory of the Brunette Sawmill Company, at Sapperton, B.C. The generating equipment is housed in a reinforced concrete building 25 ft. x 35 ft., equipped with metal sheathed doors, steel windows with wire-glass panes and being otherwise of fireproof construction throughout.

The main generating unit is a 500 kv.a., 3-phase, 60 cycle, 480 volt, 3,600 r.p.m., A-C-B steam turbo-generator designed for operating condensing on 110 lbs. steam pressure. The turbine has a rated output of 670 h.p. and has twenty-five per cent. overload capacity. The exciter used in normal operation is a 15 kw. C. G. E. turbo-generator running at 4,500 r.p.m. A second small unit of 35 kw. capacity, A-C-B manufacture, direct-connected to a 9 x 10 Ideal engine, is normally used for the lighting of the mill and the operation of several small motors, but is also counted on as a reserve exciter in case of mishap to the smaller one.

The switchboard apparatus is of the pedestal type, installed by the Canadian Westinghouse Company. A Tirrill automatic voltage regulator is used. Four main circuits are laid from the power house, two to the planing mill, one to the box factory, one to the saw-mill, the local distribution in each case being from a steel cabinet containing a slate panel upon which all the starting fuses for the various motors are mounted. The wiring is in steel conduit throughout, with approved condulet fittings. The motors for the most part are directly connected by flexible couplings to the machines they drive.

Mr. L. A. Lewis is manager of the Brunette Sawmill Company. Mather, Yuill & Company, of Vancouver, designed and supervised the installation.

Highest Transmission Voltage in the World

Transformers for a 150,000 volt transmission line are now under construction by Allis-Chalmers Company of Milwaukee, Wis. They are 4,000 kv.a. single phase, 60 cycle, oil filled, water cooled transformers for service on the Pacific coast on the lines of the Nevada-California Power Company. These transformers are designed for 36,000 and 6,600 volts on the low side and 87,000 volts on the high voltage side. Three transformers form a group which will be connected in "delta" on the low voltage side. The high voltage side is connected in "Y" to give 150,000 line voltage. The transformers are designed for an insulation test between high voltage and low voltage coils or between high voltage coils and iron of 300,000 volts, alternating current, for one minute. The principal dimensions are as follows:—diameter of base 8 ft. 10 in.; height to top of cover 15 ft. 8 in.; height to top of high tension terminals 19 ft. 10 in. With normal supply of cooling water these transformers will carry full rated load for 24 hours with a temperature rise not exceeding 40° centigrade. They will carry 25 per cent. overload continuously with a temperature rise not exceeding 55° centigrade. Each transformer complete with oil weighs about 43 tons and the efficiency at full load will, it is claimed, be considerably over 98 per cent.

Tungsten in Ontario

It is reported that a discovery of Scheelite, an ore from which tungsten is obtained, has been discovered in northern Ontario. Mr. E. G. Rognon is credited with this find, while prospecting for gold. It is said that the sample tested assays unusually high in tungsten. No official test, however, has yet been made of this ore.

Auburn Power Co. Operating

The new power house of the Auburn Power Company was put into operation early in November on the completion of the erection of the first 500 kw. generator. The station is designed for the installation of four 500 kw. units in all, three of which will be in operation before the end of the present year.

The Electric Power Company and their engineers, Messrs. Smith, Kerry & Chace, are to be complimented upon the fine appearance of this plant, as well as for the completeness with which the engineering features have been worked out. The power house, with its handsome red tiled roof, when completed will be a distinct credit to Peterborough.

The power will be available for distribution by the Peterborough Light & Power Company, who also obtain 1.500 h.p. from the American Cereal Company's power house, thus providing in a very safe and effective manner for the present power needs of Peterborough.

A 44,000 volt transmission line from Peterborough to Port Hope now nearing completion will provide satisfactorily for the interchange of power between Peterborough and other parts of the Electric Power Company's system, and will incidentally feed the new sub-station at Millbrook.

New Telephone Rates for the City of Winnipeg

We are informed that it is the intention of the telephone commissioners of the Government of Manitoba to place the entire service in Winnipeg on what is known as the "measured service basis," by charging a minimum amount for business telephones which would carry with it a sufficient number of calls to answer the purposes of any ordinary business and by making an extra charge for all calls above this number each month. Very heavy users, by contracting for a large number of calls, could get them at a favorable rate, and this would represent practically the outside amount which they would have to pay for their service.

The same system will apply to residence telephones, and will be accomplished by charging a minimum amount, carrying with it a sufficient number of calls to satisfy the average household, then adding an extra charge of so much per call beyond that amount. The idea is, if possible, to so regulate the rates as not to restrict the use of the telephone or the advantages gained by their use by constantly having before the mind of the subscriber the thought that every time he uses his telephone it means a greater expense, while at the same time it is believed this plan will tend to prevent the use of the telephone for unnecessary or useless calls. The plan outlined also includes the charge for all service by the month instead of on a six months' basis.

Saskatoon Power Extensions

The new power house being erected at Saskatoon is well under way. The steel work and most of the brick work is completed. The floor space covers an area of 85 x 54 feet. Three 500 h.p. boilers are being installed this autumn, which will operate three generators not yet set in place. The boilers are of the Babcock & Wilcox type.

It is expected that a large hydro-electric plant will be started next spring, a few miles out of Saskatoon, by a private company. It is also expected that the same company will construct and operate a street railway system. The present intention is to obtain power for the city's requirements from the hydro-electric installation when complete. To this end the power house is being made large enough to accommodate transforming equipment.

Addition to Regina Power Plant

The power house of the Regina municipal power plant has recently been extended to accommodate the necessary increase in the generating equipment. The additions are sufficient to house two 400 kw. railway sets, two 1,500 a.c. turbo-generator sets along with economizer, feed pumps and draught fans. All this apparatus will not be installed immediately, but for the present one battery of two 500 h.p. Babcock & Wilcox boilers has been installed and is operating. One 400 kw. Belliss-Siemens unit with switchboard and condenser has been operating since the 1st of August. Also two sections of 160 pipes each of Green Fuel Economizer have been installed with one Weir feed pump.

The foundations are ready for one 1,500 kw. Willans & Robinson-Siemens turbo-alternator. This machine was shipped on November 17th and will be put in place and in operation with all haste on its arrival. The extensions and improvements at the power house are in charge of Mr. E. W. Bull, city electrician.

Twenty Thousand Kilowatts Ready

The Western Canada Power Company, Limited, a description of whose transmission line appears elsewhere in this issue, have practically completed the installation of two units of 10,000 kilowatts each at Stave River, about 35 miles from Vancouver, B.C. The first unit commenced running on November 15th, and so soon as the transmission lines and receiving station can be tested out, power will be supplied to consumers. R. F. Hayward, the general manager of the company, reports about 30,000 h.p. of available business, about half of which will be connected up during the next six months, and the balance as soon as consumers can install the necessary apparatus. The Whatcom County Railway and Light Company, of Bellingham, in the State of Washington, which is controlled by Messrs. Stone & Webster, of Boston, Mass., have contracted for a supply of about 6,000 h.p. from the Western Canada Company, and the Dominion Government have authorized a license for the export of this power to the United States.

Port Stanley Line Well Under Way

The transmission line running south from St. Thomas to supply Port Stanley with light and power is under construction and will be ready at the latest by January 1st. This is a 13,200 volt line capable of carrying 1,000 h.p. However, this amount will not be required at present in Port Stanley and transforming and other equipment is only being installed to the amount of 250 h.p. capacity. This will light the streets and houses of the town and supply such power as is necessary. An interesting feature of the power situation there, arises from the fact that a number of the inhabitants of Port Stanley are fishermen. It is understood that in this connection a number of small motors have already been contracted for which will be used in the cutting of ice, which in turn will largely be utilized in packing their fish. The capacity of these motors for sawing ice ranges from 2 to 4 h.p.

Three Rivers Will Build in Spring

As the season was too advanced to commence work when the ratepayers passed the by-law to build an electric railway in Three Rivers, Que., construction has been held over until next spring. The line will be about 5½ miles in length and the council has decided to build within the city limits at the start, and later to extend the line to the various parishes in close proximity to the city.

Further Notes on Electrical Iron Smelting

By Thomas D. Robertson

Since writing about the development of Electrical Iron Smelting in Sweden (See "Electrical News" Aug., 1911) results have been obtained at the Gronwall Electric Reduction Furnace operating under the auspices of Jernkontoret (The Iron & Steel Institute of Sweden) at Trolhattan, which not only are better than any hitherto, but which the author trusts may arouse further interest in this process in Canadian electrical circles.

As mentioned in the previous article the Trolhattan Furnace was shut down at the beginning of last June in order to effect certain alterations suggested by the results of the previous six months working. These improvements involved two important changes. In Fig. 1 is shown a section of the furnace illustrating the new arrangement of the electrodes. At the time the furnace was built amorphous carbon electrodes in one piece the necessary diameter could not be obtained, so built-up electrodes were employed. These wers unsatisfactory as not only did the component parts wear away unevenly but the losses due to stump ends, which had to be thrown away, were high.

However, owing to the progress that has been recently made in the manufacture of carbon electrodes of large section it is now possible to obtain cylindrical electrodes 600 m.m. diameter by 2000 m.m. long. The specific resistance of these is less than of the older electrodes, so that the same current can be carried by an electrode of somewhat smaller area.

These cylindrical electrodes are fitted with screw joints which enable a new electrode to be screwed on to the stump of an old one, whilst the latter is in the furnace. In this way there is no loss due to stump ends, which loss had in the earlier work amounted to nearly 50 per cent. of the gross electrode consumption.

The joint between the old and new electrodes gives a good electrical contact and it is said that no heating occurs at the joint.

A further advantage of this new type of electrode lies

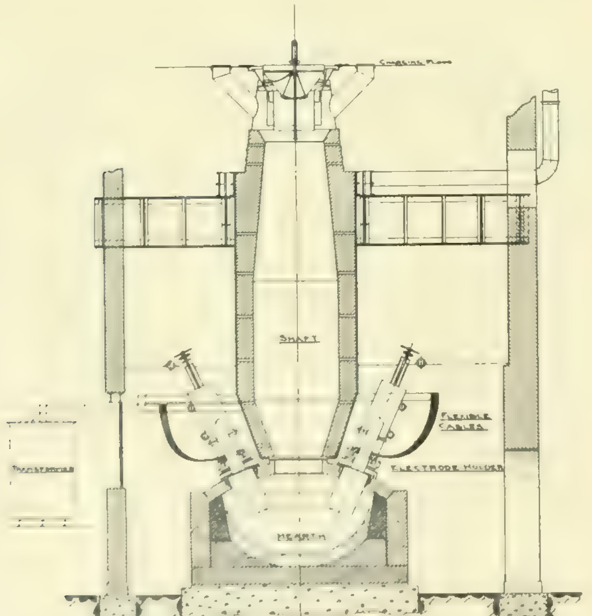


Fig 1

in the fact that an improved method of connecting the copper cables carrying the current, with the electrode, can be adopted. The old arrangement was to make this connection at the upper end of the electrode so that the current had to traverse the whole length of the carbon before reaching the charge in the furnace. Now, however, the connection is made by a water cooled copper ring which grips the electrode just above the point where it enters the roof. In this way the distance which the current has to travel is always at a minimum, and not only is the length of carbon traversed by the current a great deal shorter, but its temperature is higher and consequently its resistance considerably less than that of the cold electrode.

It will be remembered that the gas produced by the reduction of the charge was taken and, after passing through

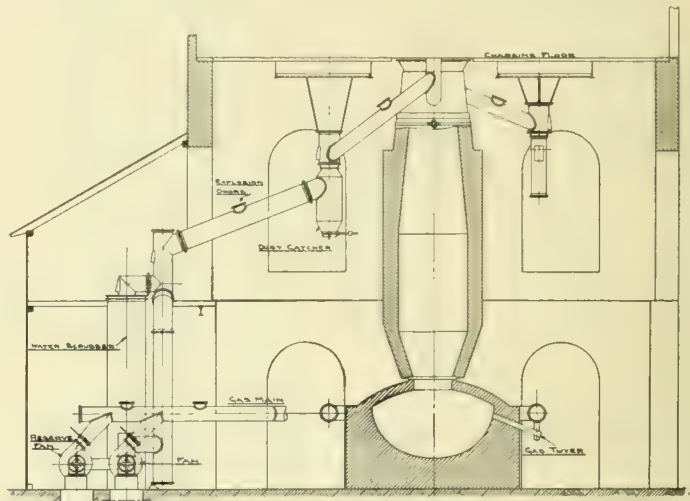


Fig 2

two dust catchers, was blown by means of a fan under the roof of the melting chamber, serving the double purpose of cooling the roof and at the same time aiding in the reduction of the descending charge during its passage up the shaft. Difficulties were however experienced in carrying out this scheme, due to the dust contained in the gas. The dust catchers installed were effective in catching the coarser dust particles, but allowed the very fine ones to pass through with the gas. On passing through the centrifugal fan this fine dust was thrown to the outside of the fan casing, where it accumulated and periodically choked the fan, so that in spite of the introduction of a jet of water into the centre of the fan this deposit became so thick that the fan had to be shut down every week for cleaning.

Some means of freeing the gas of its fine dust had to be found, so that it was decided to wash the gas in an ordinary water scrubber before passing it through the fan. The new arrangement is seen in Fig. 2. The gas is taken from the furnace top and after passing through a small dust catcher, to remove the coarser particles, is taken to the water scrubber. This is filled with wooden grid work over which water trickles thoroughly washing the gas free from fine particles. Two fans are installed, one of which is held in reserve, so that the circulation of the gas can be made continuous.

These changes in the arrangement of the plant have been productive of good results. The new electrodes have resulted in a saving of power and a less consumption of electrode per ton of iron. The new gas circulating arrangement has caused the furnace to work more regularly, and with the further improvement of introducing a portion of the ore (10 per cent) in the centre of the shaft (instead of spreading it all round the walls of the shaft as was done formerly) the production, and grade of iron is even more regular. The amount of iron produced per h.p. year has risen to a figure higher than any previously recorded.

The results obtained during the week September 3rd to 9th show a production of 3.75 (long) tons of iron per

h.p. year from ore containing 68 per cent. iron. 740 lbs. of charcoal and 126 lbs. of limestone, per ton of iron, were used for the smelting of the charge and 370 lbs. of slag per ton of iron were made, the average load on the furnace being 1815 h.p. The gross consumption of electrodes was lowered to 11 lbs. per ton of iron.

These figures would have been considered almost impossible little more than a year ago, but remarkable as they are, there is every reason to believe that the next twelve months will see a still further development as the larger electric furnaces which are being built at present in Norway and Sweden, will cut down radiation losses, and will work still more regularly and economically.

Fundamentals of Electrical Contracting

At a noonday talk of the Electrical Association of Quebec, Montreal, on November 16, Mr. J. H. Lauer, secretary of the Builders' Exchange, spoke on some fundamental principles affecting the business of contractors. There was he asserted, no such thing as luck in contracting; there were certain principles which, carried out thoroughly, must mean success. Touching upon the accounting end he said that many looked upon this as of little importance, but it was a great mistake. The greatest number of business failures in the United States and Canada occurred among contractors and the reason was that the firms did not sufficiently look after the accounting side. A mistake was often made in figuring upon the cost of labor; they calculated that the men would do a larger amount of work than could reasonably be expected and he had known instances where labor had cost 20 per cent. more than had been estimated upon. Mr. Lauer insisted upon the necessity of personal energy and the importance of reputation; one without the other was of little avail. They must remember that the owner who was looking to build had a very shrewd idea of the reputation of the contractor to whom he was going to give work. It was all very well to say that the work would go to the lowest bidder, but they knew that the reputation of the contractor was a vital factor in the awarding of the work. Some contractors looked upon advertising as a dead loss; this was a mistaken notion. They must keep themselves before the public as reputatble contractors, and when once their reputation was established they must justify it by good work. The man who was looking to do cheap work was not the man who would succeed in the end.

With regard to such associations as theirs, they were often looked upon as combinations to fight labor, and this he regarded as a wrong aspect. Referring to the importance of fixed charges in conducting business Mr. Lauer alluded to some recent labor troubles in the plumbing business in Montreal, the outcome of which was an agreement to add a definite percentage for overload charges. One question which the Electrical Association had to consider was how to get and keep a better class of electrical mechanics in Montreal. The city had the name of offering the cheapest inducements to the wage-earner in the electrical trade on the continent. The men here were paid on an average from 25 to 30 cents per hour, while in the States the average was from 40 to 45c. How could they expect to keep good men when contractors paid such wages? Then, too, there was the question of apprentices, who were paid from \$3.50 to \$4.00 per week the first year to \$6.00 in the third year, if they stayed during the latter year; \$5.50 if they changed. They could not expect to attract young men under such circumstances. There was in these days a lack of sympathy between the men and masters, and there was an ever-widening breach between the employed and the employers. There must be an earnest endeavor to get back to the personal relationship which formerly existed between the two.

Speaking on the question of co-operation Mr. Lauer referred to the benefits of the association in pressing their claims upon architects, in dealing with the relations between contractors and sub-contractors. supply houses, and in other ways.

On the question of fire losses, the speaker stated that in the United States and Canada the highest average loss per annum was \$3.66 against 49c. in six European countries per head of population; the lowest average loss was \$2.19 in the States and Canada against 12c. in Europe, and the total average \$2.67 against 23c. He suggested that electrical contractors should follow the example of the plumbers and raise their status by obtaining recognition from the civic authorities. No plumber could do work without passing an examination, whereas anyone could do wiring and call himself an electrical contractor. Many fires were due to defective wiring caused by want of knowledge on the part of people doing the work, and if the status of the electrical contractor was recognized this would, in a measure, be remedied.

Cedar Rapids Power Development

From time to time during the past few months there have appeared in the press certain statements in regard to the development of power at the Cedar Rapids in the St. Lawrence River by the Cedar Rapids Manufacturing and Power Company, and now that this development is about to take definite shape the following description will prove interesting:—

The Cedar Rapids are located about thirty miles westward from the centre of Montreal, and are familiar to all who have come down the St. Lawrence River by steamboat. There is a natural fall in the Rapids of 32 feet, and it is proposed to use this fall in producing power.

The scheme of development is very simple and consists of the building of a dyke in the river, parallel with the shore, the whole length of the rapids, the power house being between the lower end of the dyke and the north shore; the headrace will thus be formed between the dyke and the north shore.

It will be seen that no water is diverted from the river, the water entering the headrace in the river and discharging from the power house into the river at the foot of the rapids.

The Cedar Rapids Manufacturing & Power Company was incorporated by the Dominion Parliament in 1904, and then acquired the land on the north side of the river opposite the Cedar Rapids. When the company applied to the government for the right to develop the power in the river, the matter was enquired into and reported upon favorably by the Engineers of the Public Works Department. The Minister, however, referred the matter to the International Waterways Commission for their opinion as to the effect of the development upon navigation, and the Commission, after full inquiry, endorsed the plans of the company. Subsequently an agreement was made with the Dominion Government covering the work the company was permitted to carry out, and defining the quantity of water that might be used for developing power.

The company then applied for and obtained a lease from the Province of Quebec of the necessary area in the bed of the river on which to build their works, and filed with the Dominion Government the detail plans of the proposed works, which were formally approved.

The company has power to expropriate lands for transmission lines and these powers extend over the Province of Quebec and the eastern portion of Ontario.

The total quantity of power which may be developed by the Cedars Company is 150,000 horse power at the power

house, and it is proposed to make the initial development 50,000 horse power, and increase this from time to time as becomes necessary.

The physical features of the river are peculiarly adapted to the development of power at Cedar Rapids, and the difficulties of construction and operation are reduced to a minimum, so that as a source of power it will be continuous and dependable.

With such a large amount of power available within so short a distance from the city, the advantage to the city of Montreal is apparent. The cost of production will be comparatively low and will ensure a large consumption of electric power, by supplying industries now in operation, and by inducing new industries to locate there.

The advantages will not all be for Montreal, however, as the company is now in treaty with parties who intend establishing mills near the power works and so the immediate locality will receive the benefit of them.

The direction of the scheme is in the hands of Mr. D. Lorne McGibbon, who has devoted a great deal of his energy to organizing the project, and who will carry it to a successful completion. Mr. Henry Holgate is the engineer in charge of construction. The company's office is in the Richelieu Building, No. 9 Victoria Square, Montreal.

The Storage Battery in Operation

We are indebted to the storage battery department of the Canadian General Electric Company for the following interesting data concerning the installation and operation of a storage battery of the Chloride Accumulator type on the property of the Goldfield Consolidated Mines Company. Power is purchased by the company on the "maximum demand" basis. The transmission system is 100 miles long 60,000 volts, 60 cycles. The load is less than 8,000 kw. Under these conditions comparatively small load changes produced relatively large variations in voltage. To remedy this defect as well as to improve the load factor (an important item under the maximum demand charge) a storage battery of 120 cells with a motor generator set of 400 kv.a. capacity was installed.

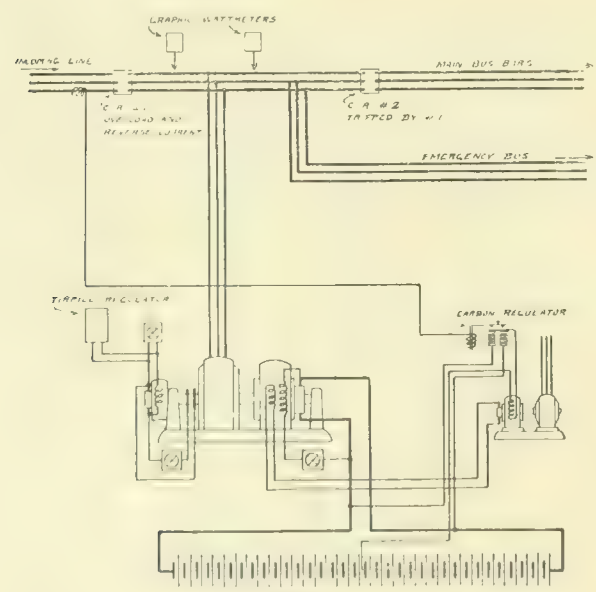


Fig. 1

The scheme of the installation is shown in figure 1, where it is seen that the motor generator set floats directly across the a.c. bus-bars with the battery between the brushes of the d.c. machines. Regulation is effected by means of a special winding on the field of the d.c. machine supplied by a special induction motor driven exciter. The field of this exciter is in turn controlled by a "Carbon Regulator" which is equipped with a "Watt Solenoid" connected on the incoming supply line. When the battery is floating the special exciter is at zero voltage; but it will be seen that any change of power in the incoming line will result in an immediate rush of current in the special winding of the d.c. machine, causing the battery to charge or discharge, as the case may be to correct such change. On account of the extremely short time element of the carbon

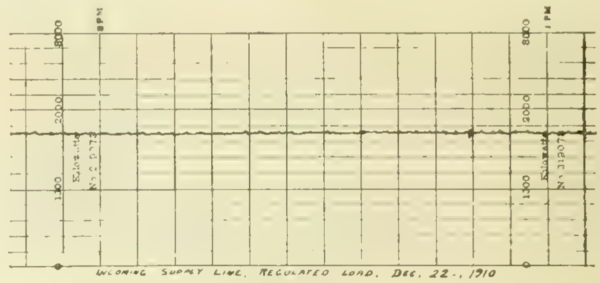


Fig. 2

regulator, correction is made so quickly that the resulting load on the incoming line may be made practically a straight line. The effect of regulation is very clearly seen by comparing the two charts shown in figures 2 and 3 taken simultaneously, one on the incoming supply line and the other on the combined outgoing feeders. The main field of the d.c. machine is self excited and is therefore weakened on

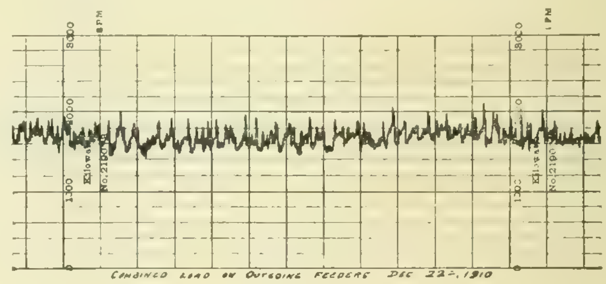


Fig. 3

battery discharge and strengthened on charge, which action assists the special field winding.

Excitation for the synchronous machine is furnished by means of a second exciter, mounted on the motor generator shaft. A Tirrill regulator is connected to the latter for the purpose of regulating the voltage of the incoming supply line by forcing the synchronous machine, within its capacity, to take lagging or leading current as may be required. The lagging components of starting current from the induction motor hoists are fully equal to the energy components and more seriously disturb the voltage. These lagging components are largely absorbed by the synchronous machine, while the energy components pass through to the battery.

The circuit breaker in the incoming supply line is equipped with time limit relays, both overload and reverse current, and is interlocked with the circuit breaker in the main bus bars, so that the battery apparatus is immediately isolated in case of failure of the power supply. The motor generator set, however, being still connected to the battery, remains in operation at approximately normal speed, and the emergency bus bars remain connected to its a.c. side. Whenever the main circuit breaker opens, it is evident that the carbon regulator must be cut out simultaneously, otherwise its action would at once tend to strengthen the field of the d.c. machine, causing the set to slow down. To prevent this, a small auxiliary switch in the carbon regulator circuit is attached to the main circuit breaker and

opened at the same time. As soon as power comes on, the set is resynchronized without any interruption to service on those feeders which were connected to the emergency bus bars. For convenience and additional reliability, the main bus bars are all in duplicate, not shown in the diagram.

Graphic recording wattmeters, one on either side of the synchronous machine, show the regulated and unregulated load curves. Fig. 2 and Fig. 3 are sample records from these meters.

The battery consisting of 120 cells, each containing 35 plates has a rated capacity of 1360 amp. for one hr., 2720 amp. for 20 minutes, or 4,000 amp. momentarily. At present the momentary fluctuations in the total demand, amount to 400 or 500 kw., as shown in Fig. 3.

On account of the maximum demand feature of the power contract it is estimated that this installation will pay for itself, in about two years by the saving effected in the power bills. Regardless of the power contract even if the Power Company and the Mining Co. were the same, the advantages of this installation in improved service and in case of emergency, or accident, to the generators would amply warrant the investment.

This system was installed by the Electric Storage Battery Co., of Philadelphia, whose agents in Canada are the Canadian General Electric Company.

Metal Filament Lamps

At a recent meeting of the Electrical Association of the Province of Quebec, held in the rooms of the Builders' Exchange, Eastern Townships Bank Building, Montreal, Mr. W. B. Shaw, of the Montreal Electric Company, Limited, gave an interesting and instructive talk on "Metal Filament Lamps."

Instead of decreasing in resistance when hot, like the old carbon filament lamp. the tungsten lamp, Mr. Shaw remarked, increased under the same conditions. The first tungsten filaments were composed of a paste of tungsten, carbon and a heavy hydro-carbon oil. This paste was forced through dies and cut into filaments which were mounted, four in a series, for the 110-volt lamp. These filaments are welded together when set up in the bulb, by means of a small electric welding tool in shape like a lead pencil, wire taking the place of the lead.

The tantalum lamp is always better on direct current and is a stronger lamp, mechanically, than the tungsten. It is, however, being superseded by the new wire-drawn tungsten lamp which is a stronger form of tungsten, besides consuming only 1¼ watts per c.p. as against two watts per c.p. for the tantalum. Further, the tungsten lamp is equally good on alternating and direct current.

Mr. Shaw warned his hearers that the candle power of the European lamp was based on the "Hefner" standard, which accounted for the European claim of 1 1/10 watts per candle power. In other words, the Hefner candle was not as brilliant as the British candle standard.

The tungsten lamp is tougher when hot so that it is advisable that dusting or any other work around a room which might shake the lamp should be done when the light is on. The word "Mazda" on the bulb was adopted as a trade name for the first standard tungstens in this country. When wire-drawn lamps came out the word "Zokul" was attached, making the new type of lamp the "Mazda-Zokul." The wire-drawn lamp was the invention of Siemens & Halske, of Berlin, and was rushed on the market too soon, but the imperfections in the early samples have been discovered and are being overcome by Canadian manufacturers.

The principal expense in the manufacture of the wire-drawn lamps is the frequent boring of the jewel through which the wire is drawn as tungsten is a very hard metal and wears out the hole, which, of course, must be accurate. Lamps are marked with three voltages; those marked 114, 112 and 110 are the best averages for use in Montreal. The candle power of a 25-watt lamp will be approximately 19½ on high reading, 17 7/10 on medium reading and 16 4/10 on low reading. Therefore it would pay to buy these lamps lasting 1,000 hours, even with electricity as low as one cent per kilowatt hour.

As an example of the strength of tungsten, Mr. Shaw stated that whereas structural steel has a tensile strength of 60,000 lbs. per square inch, tungsten is 450,000 lbs. per square inch, but unfortunately this is not maintained as the lamp gets old. Although pasted and wire-drawn lamps have faults it was the speaker's opinion that the wire-drawn is the coming lamp and will entirely supersede other makes. There is still room for improvement in this, and there is room for additional manufacturers in this field. The tungsten lamp is very sensitive, and one per cent. of variation in voltage will result in a variation of 3 7/10 per cent. in candle power. The tungsten lamp is a nearer approach to daylight than others, being richer in blue and green rays. Mr. Shaw exhibited one of the first tungsten lamps brought to Canada. It was a 40-watt lamp and cost $2.20 laid down. Today the same lamp can be purchased for 75 cents.

At the close of the paper a number of questions were asked. One member asked whether the wire-drawn lamp did not become as brittle after burning for 100 hours as the pasted type. Mr. Shaw thought it was not as bad. Another query was, why so much breakage occurred near the leading-in wire. Mr. Shaw explained that this was due to gases in the lamp because of insufficient pumping. New pumps, however, were doing away with this defect. The low voltage tungsten lamp is considerably stronger than the 110 volt types.

Mr. N. Simoneau, president of the association, occupied the chair. The discussion took place in both English and French. It was decided that the association would have a dinner every Thursday at 12.30 o'clock at Cooper's, and that talks on technical matters would be arranged occasionally. All electricians, whether living in or visiting the city, will be welcome to attend these dinners.

Recent Production of Pure Titanium

Recently conducted experiments in the Rensselaer Polytechnic Institute, Troy, New York, by Matthew A. Hunter have resulted for the first time in the production of pure titanium. Previous attempts to isolate this metal had resulted in obtaining it only about 95 per cent. pure. The method followed by Hunter consisted in enclosing titanium tetrachloride $TiCl_4$ with pure sodium in a metallic bomb, capacity about 1000 cc., constructed of machine steel and capable of withstanding a total internal pressure of 80,000 lbs. The reaction inside the bomb when heated is almost instantaneous.

Tests made on this metal in the pure form show that it is hard and brittle in the cold but is readily forged at a red heat like iron. In appearance it is much like polished steel. Attempts to draw it into wires were not successful. The melting temperature was found to be about 1,800° C; the specific gravity about 4.5; the specific heat about .1462.

The work of excavation at Healy Falls, situated 6 miles north of Campbellford is well advanced by the Electric Power Company, and it is expected that this plant will be in operation by the end of 1912. The initial installation at this point will consist of two 3,600 h.p. units. Turbines will operate under an effective head of 76 feet.

Report of Turin Meeting of the International Electrotechnical Commission

We are indebted to L. W. Gill, M. Sc., Professor of Electrical Engineering in the School of Mining, Kingston, Ont., for the following review. Professor Gill was the representative at Turin of the Canadian Section of the International Commission.

The first official meeting of the International Electrotechnical Commission which was in session Sept. 7th to the 12th, at Turin, Italy, was opened by His Excellency Signor T. Calissano, Italian Minister of Posts, who, on behalf of the Government, extended a hearty welcome to the Commission. Prof. Elihu Thomson, president of the Commission, after thanking His Excellency for his courteous welcome, then delivered his presidential address. He commented on the great influence of Italian genius upon the philosophy, science and art of the world, referring specially to such men as Dante, Michael Angelo, Galileo, Leonardo da Vinci, Galvani, Volta, Ferraris and Paccinotti. At the conclusion of his address, Prof. Thomson on behalf of the Commission, offered congratulations to the Italian nation on the fiftieth anniversary of its union. He also referred to the excellent work of the various National Committees of which the International Commission is composed, and suggested the formation of several small international committees with the object of bringing the National Committees into closer touch and thereby increasing their interest in the work. This suggestion was acted on by the Commission at a subsequent meeting.

The president's address was followed by a short report from Col. Crompton, C.B., Honorary Secretary of the Commission, on the general progress made since the last session. He pointed out that whereas in 1908 there were only 10 countries taking part in the work, there are now 21 countries in which a National Committee is properly constituted, in most cases with the assistance of the respective governments. After dealing briefly with the various subjects which were to come up for discussion, he spoke of the desire for co-operation which is evident in all quarters and as an instance of this he reported that on the invitation of the I.E.C., the British Engineering Standards Committee had appointed a joint committee to deal with all matters from the international point of view. This joint committee will consist of members of the National Committee of the I.E.C., members of the Electrical Section of the Engineering Standards Committee and Government representatives.

The next order of business was the election of officers. Mr. R. V. Picou, president of the French Committee, after referring in a very courteous manner to the splendid work and the keen interest of Dr. Budde (Germany), from the inception of the Commission, proposed that he be elected president. This proposal was seconded by Mr. C. A. Rossander, president of the Swedish Committee, and was carried by acclamation.

Prof. Feldmann (Holland) then proposed that Col. Crompton, the father of the I. E. C., should be re elected Honorary Secretary. This was seconded by Prof. Lombardi (Italy) and was carried unanimously.

On Sept. 8th and 9th there were two unofficial meetings presided over by Prof. Lombardi of Italy. The agenda for these meetings had been before the various National Committees for some months previously. The delegates were thus acquainted with the questions to be discussed. The first question taken up was that of nomenclature. On behalf of the small committee which was appointed by the unofficial meeting held in Brussels, Dr. Budde presented a report on the work accomplished to date. After some criticism and discussion this report was adopted provisionally. (The word "provisionally" is intended to imply that modifications may be made at the next meeting). This list is to be issued in both alphabetical and logical orders.

The French Committee submitted a copy of their vocabulary containing terms considered by them with the view of assisting the committee on nomenclature.

The British Committee also submitted their latest work on nomenclature (letters F to M) with an unofficial French translation.

It was decided that the special committee on Nomenclature, consisting of one delegate each from the British, French and German Committees, should remain in being until the next meeting of the Commission.

The following proposal dealing with symbols was provisionally adopted.

1. Instantaneous values of electrical quantities which vary with the time are to be represented by small letters.

2. Virtual or constant values of electrical quantities to be represented by capital letters.

3. Maximum values of periodic electrical quantities to be represented by capital letters followed by subscript "m."

4. Magnetic quantities, constant or variable, to be represented by either capital, script, gothic, heavy-faced or any special type.

5. Maximum values of magnetic quantities to be represented either by capital, script, gothic, heavy-faced or any special type followed by the subscript "m."

6. The following quantities to be represented by the following letters:

Electromotive force	E,e
Electric quantity	Q,q
Inductance (coefficient of)	L,**L**
Magnetic force	H,h,**H**
Magnetic flux density	B,β,**B**
Length	L,l
Mass	M,m
Time	T,t

Dr. Budde, in the name of the German Committee, seconded by Mr. Alexander Siemens, in the name of the British Committee, proposed the definite adoption of the letters I.E,R, to represent the current, the electromotive force and the resistance in the simple algebraical expression for Ohm's Law. This proposition was unanimously adopted.

Mr. Picou proposed and Mr. Feldmann seconded the proposition that in questions relating to alternating currents, the term "Reactive power" be adopted to designate the quantity UI $\sin\phi$. This proposition was adopted.

A special committee consisting of one member from each of the following countries, was appointed to continue the study of the question of international symbols:

Belgium, France, Germany, Great Britain, Holland, Italy, Spain, Switzerland, United States of America.

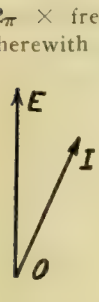
The supplementary propositions of the French committee were referred to this committee for consideration and at the suggestion of Prof. Feldman, the question of special terms of a similar nature to "Reactive power" was also referred to this committee.

The following proposition with reference to alternating current quantities was adopted:

In the graphical representation of alternating electric and magnetic quantities, advance in phase shall be represented in the counter-clockwise direction.

In consequence, the impedance of a reactive coil of re-

sistance R and inductance L is $R + \sqrt{-1}\,L\omega$ and that of a condenser of capacity C is $\frac{1}{\sqrt{-1}\,C\omega}$ where ω is equal to $2\pi \times$ frequency. It follows also that the diagram shown herewith represents the phase relations in a simple alternating current circuit containing an impressed electromotive force O E and a lagging current O I.



The propositions of the Unofficial Conference held at Brussels, relative to the rating of electrical machinery and apparatus, were adopted without modification as follows:

1. The output of electrical generators is defined as the electrical power available at the terminals.

2. The output of electrical motors is defined as the mechanical power available at the shaft.

3. Both the electrical and mechanical powers to be expressed in international watts.

A special committee, consisting of one member from each of the following National Committees was appointed to study the subject of the international rating of electrical machinery and apparatus:

Belgium, France, Germany, Great Britain, Italy, Sweden, Switzerland, United States of America.

Prof. Elihu Thomson drew attention to the "Extract from the rules of various countries in reference to the rating of electrical machinery," published by the central office. He pointed out that this work, the value of which he was glad to recognize, would likely prove of great utility to the special committee.

In the name of the Italian committee, Mr. Jena presented a report dealing with this subject and especially with the question of prime movers when closely related to electrical machinery.

The report was referred to the special committee with instructions to give most careful consideration to the proposals of the Italian committee.

The national committees are requested to put themselves into communication with the technical societies of the respective countries in order to facilitate the work of the commission.

The proposition of Signor Lombardi and Mr. Alexander Siemens, that the next official meeting of the I. E. C. be held in Berlin in 1913 was adopted, the exact date to be fixed by the central office after consultation with the national committees. An unofficial meeting may be arranged in the meantime, if necessary.

Mr. Gano Dunn, as president of the A. I. E. E., cordially invited the I. E. C. to hold an official meetting at San Francisco in 1915 on the occasion of the Panama Pacific Exposition, to be held in celebration of the opening of the Panama canal. He announced that the A. I. E. E. was desirous of holding, at the same time, an International Electrical Congress, that the board of directors of the A.I.E.E. had already taken official action and passed resolutions authorizing the congress and instructed him to appoint a committee on organization, provided that an expression of opinion favorable to the holding of such a congress were obtained from the I. E. C. at its meeting at Turin.

The meeting thanked Mr. Gano Dunn for the very cordial invitation of the A. I. E. E. and on the proposition of Mr. Feldman, seconded by Mr. Duddell, adopted the following resolution:

"The I. E. C. expresses its willingness to hold an official meeting at San Francisco in 1915 and instructs the central office, on the request of the A. I. E. E., to co-operate with it in the organization of an International Electrical Congress at San Francisco at the same time."

The Honorary Secretary of the Illuminating Engineering Society of London (Mr. Leon Gaster), specially invited to attend the meeting of the commission, mentioned the question of the commission studying the terms employed in matters of illumination and requested that the national committees be asked to put themselves in communication with the societies, in their respective countries, dealing with these questions.

Dr. Kennelly, speaking as president of the Illuminating Society of the United States of America, and Dr. Clayton Sharp, past president of the society, were favorable to this idea and the meeting expressed an opinion favorable to the suggestion.

The second plenary meeting was held on September 11th and all the above proposals which were adopted at the unofficial meetings were officially passed by the commission.

The International Congress of Electrical Engineers, which was assembled at Turin at the same time, after considering the question of future meetings, decided to ask the I. E. C. to accept the task of organizing all future international meetings of electrical engineers. In connection with this request it was pointed out that the Electrical Engineers had no international organization, while the I.E.C. had such an organization established, and was therefore in a position to assume the responsibility referred to.

The final meeting of the council of the I. E. C. was held on September 13th, and it was decided to accept the responsibility of organizing future international congresses of Electrical Engineers, as requested.

From the above statement covering the work of the commission at Turin, it appears that its machinery has at last been adjusted to the point of working efficiency. The international status of this commission is now in keeping with the importance of its work, and its official recognition by the electrical engineering profession, through the Congress of Electrical Engineers assembled at Turin, is an incident of the utmost significance. This not only ensures to the I. E. C. the sympathy and support of the whole profession, but it is in large measure a guarantee that the decisions of the I. E. C. will be accepted and introduced into practice. In this case the fruits of the labors of the I. E. C. will not meet the same fate as those of other efforts along similar lines, and the individual members will in time be rewarded with the thought that their efforts were not in vain.

If the standards laid down by this commission are accepted and introduced by all the manufacturers of the various countries, the result will be of great mutual benefit. From the point of view of the Canadian manufacturer, for example, it will be of advantage to him to know exactly on what basis the machines of his competitors are rated, to know, for instance that the rating of foreign (European) motors is based on the same unit as his own. (At present all motors are rated in horsepower, and the European horsepower is smaller than the British and Canadian).

In addition to this there will be more uniformity in specifications. The work of the consulting engineer will then be easier, for as far as possible his specifications will conform to I. E. C. standards. This will in turn make it easier for the manufacturer, for he will understand at once what performance is required of his apparatus. There will be less call for special apparatus—that bugbear of the American manufacturer. The designing and consulting engineers will find it much easier to keep in touch with the work in other countries, for they will be familiar with the standards of the latter. As the work of the commission proceeds there will be less excuse for the apparent contradictions which often appear in our electrical literature. Altogether the outlook in the direction of standardization is very promising.

The Pacific's Magnificent Water Powers

The big Western Canada Plant operating—Steel Tower Transmission Line, Suspension Insulators, 60,000 volts—Built for 50,000 h.p.—A full description of the line

By Frederick D. Nims*

About the time the Electrical News goes to press the first steel tower transmission line in British Columbia is going into service. This is the line of the Western Canada Power Company from its hydro-electric plant at Stave Falls to Vancouver and New Westminster. While the line is not one of great length, there are several unique features in connection with it, as well as the distinction of being the first steel tower line on the Pacific Coast north of those feeding San Francisco and vicinity.

The Western Canada Power Company has its hydro-electric plant on the Stave River, about 35 miles east of Vancouver, and six miles from the station of Ruskin, which is on the main line of the C. P. R. At this point concrete dams and powerhouse have been built capable of developing 52,000 h.p., although at the start but two units of 13,000 h.p. each are being installed. The turbines, built by the Escher Wyss Co. of Zurich, Switzerland, are direct coupled to generators built by the C. G. E. Co. These generators are rated nominally at 7,500 kw. each, but are capable of developing 25 per cent. overload continuously at 80 per cent. power factor.

The generator voltage is 4400 at 60 cycles, 3-phase, and is stepped up through two banks of single phase 3,000 kw. transformers to 60,000 volts for transmission purposes. The main transmission line, which is 32 miles in length, terminates at Ardley, a point on the Great Northern Railway, almost equidistant from Vancouver and New Westminster.

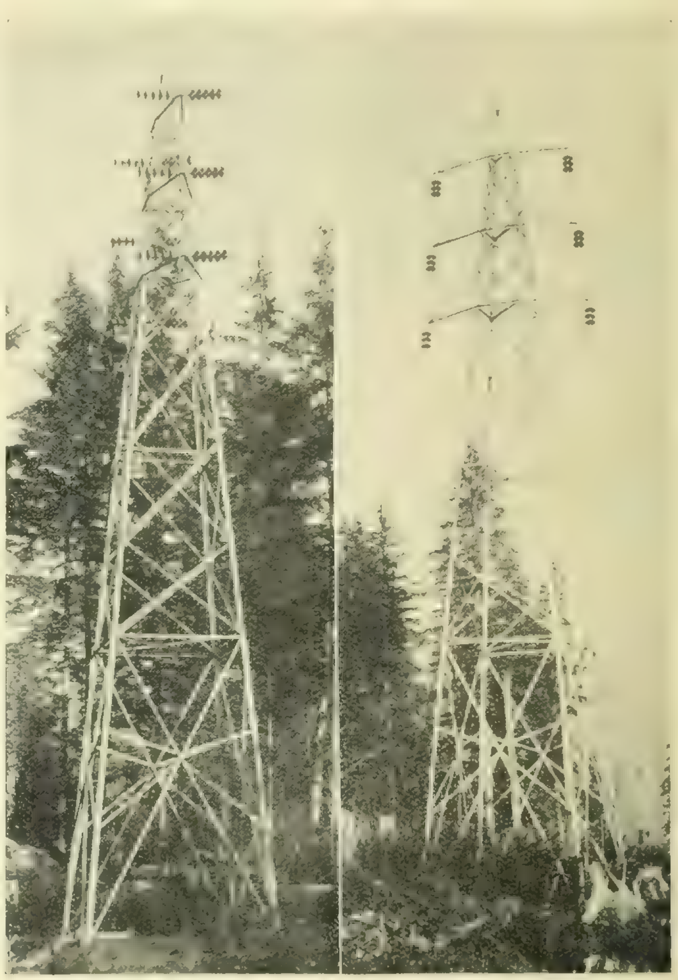
The standard transmission towers carry two three-phase circuits of No. O hard drawn stranded copper cable with hemp centre, and one 3/8 galvanized steel ground wire the over all height being 59 ft. and the point of support of the

W. C. P. Co.'s Receiving Station at Ardley, B. C.

lowest wire being 41 ft. above the ground. The standard span is 660 feet, but is was necessary to vary this considerably at times, owing to inequalities in levels of the ground.

The standard towers are built and were satisfactorily tested to withstand strains of 2,000 lbs. in any horizontal direction at any point of support for the lines, or 8,000 lbs. in any horizontal direction on the tower as a whole at the centre of gravity of the points of support. The vertical loading is 1,500 lbs. on each point of support or 9,000 lbs. on the tower as a whole. For dead ends or sharp angles, anchor towers are used capable of withstanding twice the strains of the standards.

The standard tower has angle iron posts set 6 ft. 6 in. into the ground, bolted at the bottom to a cross of angle



1. Anchor Tower. 2. Standard Tower, W. C. P. Co's 60,000 volt line.

iron, the holes being loaded and tamped with stone and rock. The anchor towers are provided with castings for feet, which are bolted to a concrete foundation. The weight of the standard tower is 2515 lbs. and the anchor tower about 4,000 lbs.

The line on leaving Stave Falls runs through a rolling country, heavily timbered, and it was necessary for a few miles to clear a right of way for 600 feet in width, some trees being encountered standing 275 ft. high and 9 ft. diameter at the butt. The line is on the right of way of the Dewdney Trunk Road, and an agreement was made with the Provincial Government for this location, the centre line of the towers being 7 ft. from the north boundary of the

*Electrical Engineer, Western Canada Power Co.

road, throwing the legs of the towers and the wires themselves about one foot south of the property line. Several creeks and gulches are crossed and in one case the span on standard tower runs up to 1020 feet.

About 14 miles from Stave Falls the line comes out on the Pitt Meadows, a flat grassy delta, which was formerly flooded each spring by the Pitt River. The Government has dyked the river and installed pumping stations to take care of the flood water, but the plain is still quite marshy, so that it was necessary, in order to obtain a good foundation, to drive piles for each tower crossing the meadows, about 50 in all. These piles, driven to hard pan, average about 18 feet in length and are capped with 6-in. x 8-in. cedar timber. A special foot was designed to meet the condition and the towers bolted direct to the timber.

The Pitt River, a navigable stream, is crossed here on a span 1360 ft. in length, and as it was necessary to provide at least 100 ft. at the lowest point of the span a special construction was resorted to. A galvanized steel tower, 165 ft. over all in height, and 140 ft. from ground to low wire was placed on a concrete and pile foundation just outside the dyke on each bank of the river. A rocker tower, set to give an angle to the main line, of about 45 degrees is the starting point of the line wires. This rocker tower is securely anchored by one-inch steel cables to a concrete and pile anchor. The main span is dead ended at the rocker tower on each side and is free to move longitudinally on the supports of the main tower, so that these act simply as struts to afford height and have no

Rocker Tower with Anchor Tower in distance, W.C.P. Co.

strain due to the line itself. The main cables are of ½-in. plow steel. It was necessary to hang two sets of insulators in parallel, connected with compensating links for each point of support and for the dead ends of this crossing, as the strains were too heavy for a single set of insulators.

All the insulators and hardware were supplied by the Ohio Brass Company, three of the 10-in. suspension discs being used on straight line construction and 4 discs on strains. The towers were all built by the Riter Conley Company of Pittsburg.

At Ardley the voltage is stepped down to 13,000 volts through 3000 kw. single-phase transformers. This is carriel on cedar pole lines to two sub-stations in Vancouver and two in New Westminster, where it is stepped down to 2300 volts for distribution purposes. The distribution

Rocker and River Towers and Telephone Line, W. C. P. Co.

system is steel taped armored cable, laid directly in the ground without conduits.

A 35-ft. wooden pole line is carried the entire distance on the opposite side of the road from the main transmission line, and this pole line carries a circuit of 13,000 volts for local distribution to the small towns, farms, &c., along the route as well as carrying the telephone circuits.

A 13,000 volt line runs also from Stave Falls through Mission City, Matsqui and Abbottsford down to Sumas on the International boundary, a distance of 18 miles. This will be replaced with a tower line at 60,000 volts as soon as business demands it. The 13,000 volt line crosses the Fraser River at Mission in a submarine cable, 1,950 ft. in length.

Smart Work of Cable Repairers

Some time ago a fault developed in the British Columbia Telephone Company cable between the mainland and Vancouver Island, as a result of which the service was seriously impaired. The trouble was located in the 8,200-foot section between San Juan and Shaw Islands, in the Gulf of Georgia. A day and a half had been allowed for the work of removing the old cable and laying the new one, in expectation of certain difficulties to be met with, but conditions proved so favorable and everything worked so smoothly owing to the careful preparations made, that the old cable was lifted and the shore end of the new section landed in exactly four hours and fifteen minutes.

The new cable was 400 feet shorter than the old one, the saving being rendered possible owing to its being laid during a period of slack water, nothing being lost by the tide carrying the cable off the line of the surveyed route, as was the case when the first cable was laid six years ago. The section lifted and replaced had many worn spots in its protective covering, caused by chafing against the rocks under tidal action. In places the cable was as big around as a barrel owing to the accumulation of marine growth of various kinds.

Hydro-electric Power Scheme at Kamloops

The increasing population and commercial growth of Kamloops has stirred its enterprising citizens to the consideration of a scheme for the development of hydro-electric power, the Barrier river being the suggested source of supply. The approximate outlay is placed at $250,000 for 5,000 horsepower, but the initial development of 2,000 horsepower would call for only $190,000. In addition there would be the purchase of a centrifugal pump of 100,000 gallon capacity per day, costing complete with motor $5,500, and the construction of a reservoir with a capacity of one million gallons, cost $28,000, including mains—present expenditure $223,500. In compliance with the wish of the council the engineer, Mr. Dutcher, of Dutcher, Maxwell & Gregory, Vancouver, furnished a supplementary estimate on a unit of 1,000 horsepower, which showed that the cost would be only about $18,000 less than for a 2,000 horsepower unit. The mayor and other members of the council thought it would be false economy to adopt the 1,000 horsepower unit, and instead favored the adoption of Engineer Dutcher's plans for an initial development of a 2,000 horsepower, though Ald. Bauman contended that the low head provided for was a big mistake and made it doubtful if 5,000 horsepower could be developed, while by going three or four miles farther up the river 10,000 horsepower could be secured. The municipality proposes to sell power for irrigation purposes along the line, from which considerable revenue could be derived.

Double-tracking Branch System

The management of the British Columbia Electric Railway Company has recently awarded two contracts in connection with the double-tracking of the branch of its system extending from Vancouver to Eburne. This stretch forms a part of the Lulu Island Railway and is operated by the B. C. E. R. Co. under a lease from the C. P. R. The entire line is now single track from Vancouver to Steveston, as well as the branch line along the North Arm of the Fraser river to New Westminster, but settlement is proceeding rapidly in the surburban area along the line adjacent to the city necessitating the double-tracking of this stretch. The contracts awarded are to Mr. Geo. H. Webster, of Vancouver, for grading four miles of the line in readiness for track-laying and ballasting, this work including the stretch between Twenty-fourth avenue, Point Gray, and Eburne, and to Armstrong, Morrison & Company, of Vancouver, for the reconstruction of the bridge over False Creek used by the line in approaching the central district of Vancouver. The bridge is about 1,500 feet in length, of trestle construction. It will be double tracked throughout with the exception of the drawspan, Australian hardwood piles being used, the work covering a complete reconstruction of the bridge. In connection with the double-tracking the company will improve the line by using 60-lb. rails throughout. The new track will be laid just to the east of the present track, following practically the same line and grade as now exists. While the contractor is proceeding with grading, the company will complete the double-tracking of the line from 24th avenue to the Vancouver terminal as well as similar work on the city extension of the line from the south end of the False Creek bridge to Kitsilano.

The lighting system on Granville street bridge, installed a couple of years ago, has never given satisfaction and is to be remodelled. Mather, Yuill & Company, Limited, electrical engineers, have been awarded the contract by the city. The carbon lamps at present in use will be replaced by series tungsten, the old standards being retained.

City Electrician McCrossan reports that the number of inspectors in his department will have to be increased in the near future owing to the tremendous amount of work involved in examining and testing the lighting systems in the hundreds of new dwellings, apartment houses, business blocks and factories reported for inspection from month to month.

The Discoverer of Radium Gets Another Nobel Prize

It has just been announced that one of this year's Nobel prizes, that given for chemistry, has been awarded to Mme. Curie of the University of Paris. Mme. Curie is the head professor of experimental science in the University of Paris and will be remembered as the co-discoverer, with her husband, Professor Curie, of the wonderful substance radium. This was in 1903, and the Nobel prize awarded for this discovery was shared in equally by Professor and Mme. Curie. Since the date of the discovery of radium Mme. Curie has succeeded in producing polonium, an element possessing properties very similar to those of radium. Each of the Nobel prizes, of which there are 5 awarded annually, is valued at $40,000.

New Books

Direct and alternating current manual—by Frederic Bedell, Ph.D., and Clarence A. Pierce, Ph.D. The D. Van Nostrand Company, New York, publishers; price $2 net. The manual consists of a series of tests on direct and alternating current apparatus selected with reference to their practical usefulness and instructive value. The author has gone farther however than to merely outline the methods of testing and has explained the principles that underlie the various experiments and the design of the various apparatus used. The book will be found useful either as a text or for reference. The manual contains frequent and excellent illustrations.

Short course in electrical testing.—by J. H. Morecroft, E.E., B.S., and F. W. Hehre, E.E., D. Van Nostrand Company, New York, publishers; net price, $1.50. This book is designed for students in Columbia University who are required to take courses in the electrical laboratories in testing both direct-current and alternating-current machinery but who have not had such training in the theory of electrical machinery as is necessary for a proper understanding of the machines. The methods of testing given are practical and for the most part simple. The book will therefore be valuable to all operating engineers who need from time to time to make tests of the machinery under their charge. It is clearly illustrated and written in language as untechnical as the subject matter will allow.

Personal

Mr. R. P. Read has been appointed manager of the business department of the Montreal Light, Heat and Power Company.

Mr. R. G. Black, electrical engineer Toronto Electric Light Company, sailed for England on November 14th, on a much-needed holiday. Mr. Black's many electrical friends hope that he may speedily be restored to his usual robust health and strength.

Mr. Thos. D. Robertson, on Thursday evening, November 2, read an interesting paper before the Engineers' Club, Toronto, on the subject "Recent Progress in Electric Iron Smelting." Mr. Robertson's paper dealt chiefly with the progress that has been made in this industry in Sweden and Norway.

Mr. Herbert C. Barber has been appointed assistant electrical engineer in Hamilton, Ont., in connection with the installation of the half million dollar distribution system there. Mr Barber has had a wide and varied experience in connection with Toronto's big municipal enterprise which will make him all the more valuable to Hamilton. He assumes his new duties with the new year.

Winnipeg Municipal Plant in Operation

A Minute Description of the Generating, Transmitting and Distributing Equipment of one of Canada's Biggest and Finest Power Undertakings

One of the most complete and up-to-date plants in Canada is the municipal plant recently placed in operation in Winnipeg. The advisability of constructing a municipal plant was discussed by the council in 1905 and Mr. C. B. Smith was retained by the city as consulting engineer and made a thorough examination of the various water power sites on the Winnipeg River. Careful surveys were made of the most promising sites, and Point du Bois was finally selected as the one offering the greatest advantages. Estimates were prepared and $3,250,000 was voted by the people in June, 1906, for the construction of the system. Designs were begun that year. but the financial depression of 1907 caused the loss of a year, since which time the work has been rushed to completion, the first power having been delivered over the lines October 16th, 1911.

During 1906 and 1907, however, sufficient money was voted to build a tramway 24 miles in length connecting with the C. P. R. at Lac du Bonnet. This was a considerable engineering undertaking requiring as it did the erection of a bridge with a swing span across the Winnipeg River and the laying of track for miles through the muskeg, where cross-ties 30 to 40 feet long were used so that the track practically floated on the muskeg. The soundness of the construction has been thoroughly tested by bearing excursion trains as well as the many trainloads of materials and machinery.

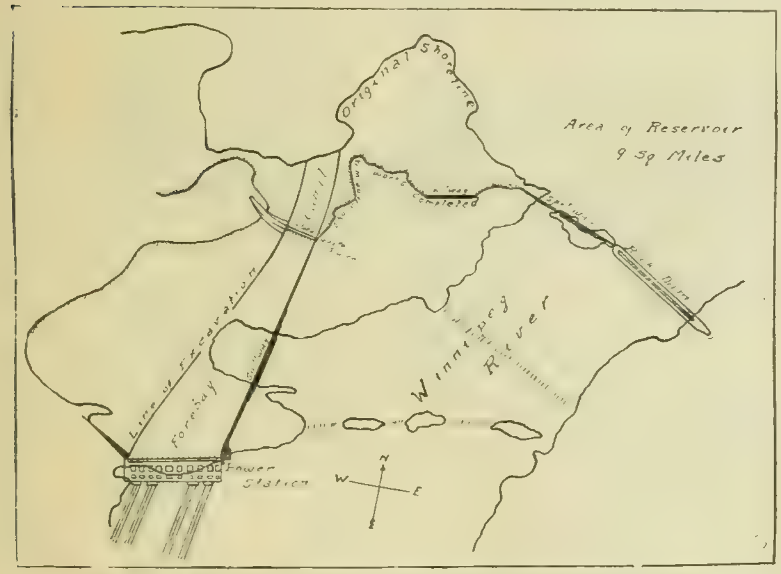


Fig. 1.—General Layout of Winnipeg Muni ipal Plant.

A telephone line which connected all the camps, the power site, et cetera, with the engineer's office in Winnipeg has also been of the greatest service in the construction of the plant and line..

Hydraulic.—The site chosen is at what is known as Point du Bois on the Winnipeg river about 75 miles from Winnipeg. Reference to the Electrical News for August will show the location of this site with reference to Winnipeg.

There was a natural head of about 32 feet at this point, but by the construction of hydraulic works this has been raised to 45 feet, drowning out the Lamprey Falls of 14½ foot head and providing a mill pond of about 6,000 acres. The maximum head is 47 feet and the minimum 45 feet. The designs for the plant were based on this latter head with an average minimum flow of 12,000 second feet. It was estimated by the engineers that assuming that the average minimum flow, equivalent to 65.000 h.p., for 24 hours were converted into electrical energy, the pondage as above noted would provide sufficient water for a peak load of 108,000 h.p., assuming that the daily load factor was 60 per cent., which is a load factor much higher than usually obtained. As the plant is designed for an ultimate hydraulic capacity of 80,000 h.p., ample margin seems to have been allowed for periods of low water. The minimum flow for the past four years has been about 13,000 second feet and the maximum 55.000. According to all reports the Winnipeg river has the most uniform flow among the undeveloped rivers of America and it could be readily improved at comparatively small expense.

The site selected is very favorable to hydraulic development as a comparatively small amount of work was needed considering the amount of water handled, and the bed rock which comes very near the surface at this point provided an excellent foundation for the work, as well as a superior grade of stone for the concrete construction.

Fig. 1 shows the general layout which comprises a rock filled dam and spillway 650 feet long across the main channel of the river, a low weir across a dry point of land, an intake with spillway and waste sluice above it, a forebay wall with spillway 225 feet long and waste sluice above power house racks, and the canal closed by the power house structure 476 feet long and by a wing dam to the west shore line. Considerable pains have been taken in the design to obviate any blocking of racks by ice, or debris, for the spillways above the control gates and racks will discharge cake ice and the sluiceways can be used for removing any refuse and ice above the racks. As will be noted from the accompanying cross-section, Fig. 2, the racks rest on an apron under which is an air space connecting with air spaces in the forebay walls near the power house and extending up stream under the waste sluice. As this air will remain at a temperature above 32 degrees F. it is thought that this will prevent head-gate slots freezing up. As will also be noted from this cross section the rack supports are arranged in the plane of the current and offer a minimum amount of obstruction to the flow of the water.

The designs call for the following water velocities at full load on the equipment: Control gates 6.4 ft. per sec., outer piers of rackroom 1.5 ft. per sec., steel rack 1.7 ft. per sec., wheel pit inlets 2.8 ft. per sec., turbine runners 20. ft. per sec., neck of draft tube 8. ft. per sec., exit of draft tube 3.3 ft. per sec.

Inlets 16 ft. x 20 ft. are provided for the wheel pits which are cylindrical in form and 28 ft. in diameter. The turbines are 2 runner Boving make and have an ultimate capacity of 5,200 h.p. at 164 r.p.m. at 45 ft. head and pass 1,250 cu. ft. of water per minute at this output and have a guaranteed efficiency at full load of 84 per cent. The turbine runners are of forged steel with cast iron hubs and rims, and there are three bearings, two of which have forced grease lubrication and the third standard oil rings. The turbine gates are of the flutter type controlled by Boving governors which furnish oil under heavy pressure to either side of a powerful piston operating the gate shafts

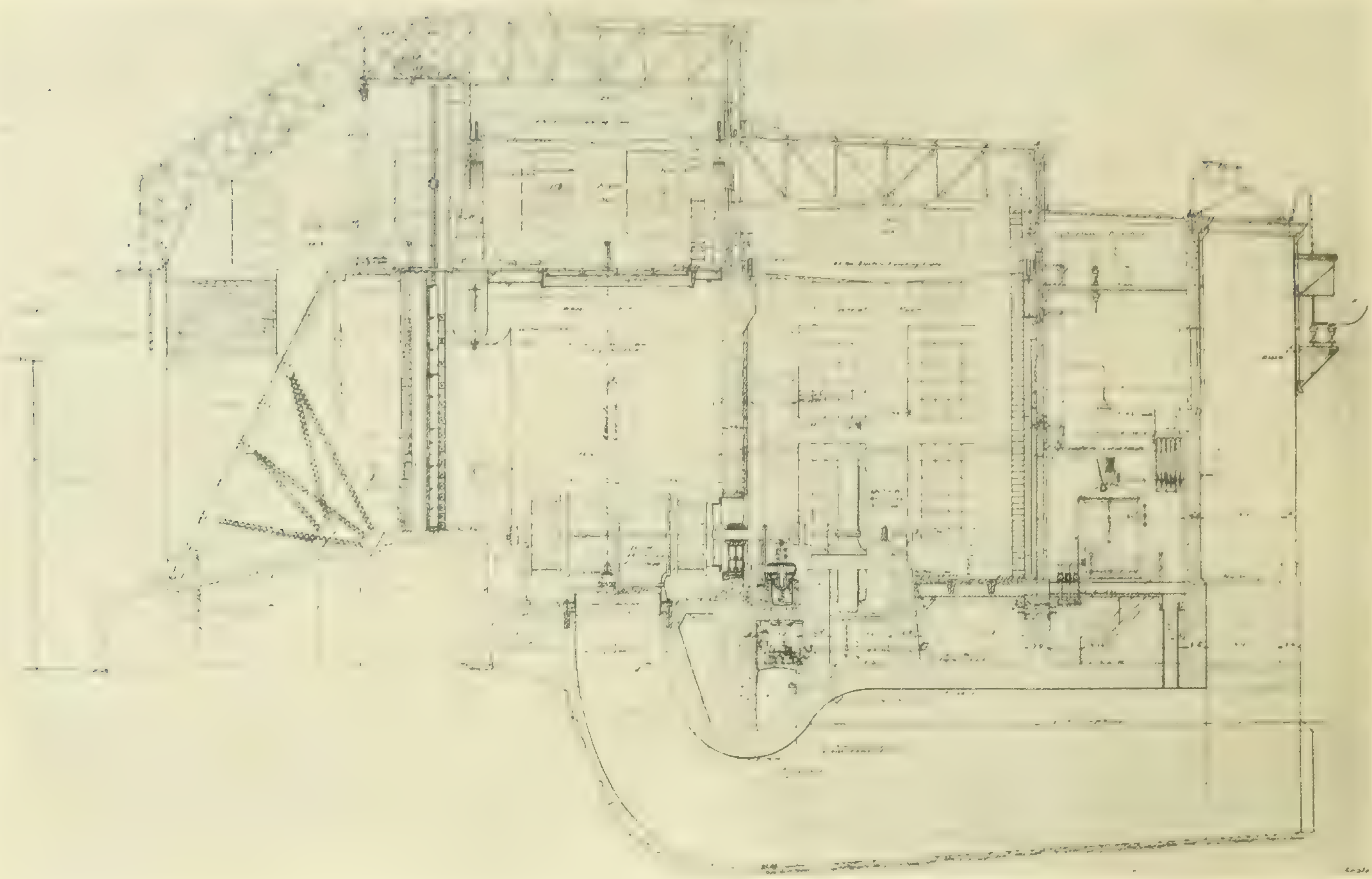


Fig. 2.—Cross-Section Generating Station of Winnipeg Municipal Plant, Point du Bois.

by a strong lever system. There is a separate oil pump of the rotary type, storage cylinder, governor and servo-motor for each turbine. The makers guarantee a regulation of 2.5 per cent. on 20 per cent. change in load and 15 per cent. on 100 per cent. change on the basis of a fly wheel effect of 1,535,000 lbs. feet squared.

The speed of the turbine can be electrically regulated by means of a small motor on the governor and operated from the switch gallery so that the operator has full control of the synchronizing of the generators.

The head-gates are raised by motor driven nuts upon double threaded screws 40 ft. long. Clutches are provided so that four gates are served by each motor. The two exciter turbines of 400 h.p. each. are also of Boving manufacture. These are located in a large bay near what will be the center of the completed plant and they are provided with large fly wheels.

The Building.—The initial installation is housed in a reinforced concrete structure 252 ft. long by about 130 ft. wide. This comprises gate room, turbine room, generator room, switching and transformer bay, lightning arrester rooms and a large basement. An excellent finish has been secured on most of the concrete work and the general effect is very good. The turbine side of generator room has a veneer of face brick separated from the concrete wall from floor to top of water level, so there is no condensation on the face of the brick. The large number of windows provide excellent lighting. A 20-ton electric Niles crane serves the turbine room and has proven very useful in the erection of the turbines. A 45-ton electric crane of the same make covers the full length of the generating room.

Electric Equipment.—This comprises generators, transformers, cables, switching apparatus, protective apparatus, control boards and auxiliary equipment.

[illegible] has been made up of three 3000 kw. generators, one bank of three 3000 kw. transformers and a transmission line, and there are two such units in the present equipment except that only five generators are installed at present.

The electrical layout of the station is simple and at the same time flexible enough to secure the reliability needed. The ultimate layout provides for four transmission lines, 15 generators and one spare generator.

The generators were provided by Vickers Sons & Maxim, England. They are each of 3000 kw. capacity and generate at 6600 volts, 60 cycles, 3 phase. 164 r.p.m. The windings are of formed coils, open slots, and 3 slots per pole per phase. A full load efficiency of 95.2 per cent. regulation of 8.5 per cent. at 100 per cent. p.f. and temperature rise of 35 degrees C. at 100 per cent. p.f. is guaranteed by the manufacturers. The rotor construction is somewhat different to standard practice in this country, consisting of two cast steel fly wheels with hubs registered and four breaks in each with four forged steel shrink rings. The rim is dovetailed for the 44 poles and these are keyed in with folding keys. The total rotor weight is 57,300 lbs. and it is 14 ft. 1 in. in diameter with an air gap of 4/10 in. The outside diameter of stator is 16 ft. 8 in. and total weight of generator is 155,500 lbs. Bearings are provided with ring oiling lubrication and there is also an emergency gravity lubrication with a complete arrangement of filters, etc. The generators were tested in the factory to 275 r.p.m. and with short circuit at full voltage and full speed with no injurious effects on the machine. A motor operated rheostat and solenoid-operated field switch is mounted on the wall back of each generator. The two exciters are each 250 kw. 125 volt, 400 r.p.m. and are provided with interpoles. Provision is made for the future coupling of induction motors to these exciters.

The transformers are of 3000 kw. capacity, 6600 to 66000 volt ratio with taps giving 53000 and 72000 volts.

They are water cooled with brass cooling coils good for 250 lbs. per sq. inch and require 12 gallons of water per minute per transformer to dissipate full load losses. They have guaranteed efficiencies of 98.7 at ¾ and 98.6 per cent. at 1¼ loads. They are provided with condenser bushings and are in a boiler iron case with safety valve for discharge of gas in case of trouble and have quick opening gate valve which will dump the oil into the tail race. The transformers are delta connected and occupy isolated compartments. Between the banks of the transformers are the switch rooms, the low tension switches being on the bottom floor and the high tension switches on the floor above. The cables from the generators are carried on 6600 volt insulators suspended from the basement ceiling to the type C 1200 amp. oil circuit breakers which are mounted on a concrete structure. All bus bars and instrument transformers are isolated by concrete barriers. The bus-bar work is all of built up copper strap. Disconnecting switches are provided inside the transformer delta connections so that any transformer may be isolated in case of trouble. The high tension side of the transformer is controlled by Westinghouse type GA oil circuit breakers with condenser bushings, each pole being in a separate steel tank. The breakers have a rupturing capacity of 80-000 kw. at 66000 volts. Disconnecting switches are mounted on a steel structure over the oil circuit breakers. The h.t. bus-bars are of ⅝-in. copper tubing. A minimum spacing

Fig. 3.—Four 3,000 K.W. Generators, Point du Bois.

of 4 feet between conductors and 2 feet to ground is maintained.

Protective Equipment.—From the high tension switch rooms the lines run into the lightning arrester through choke coils and Locke insulator bushings to the wall brackets overhanging the river. Standard electrolytic arresters are placed in each of the compartments, the different phases being isolated. On the roof is mounted in each phase a horn gap and fuse and a horn gap and carborundum resistance. The generator circuit breakers are provided with inverse time-limit overload relays. The circuit breakers on the low tension side of transformers have I. T. L. overload relays and on the high tension side straight overload relays.

Control Equipment.—The control gallery is located at one end of the present generating room opposite the exciter bay. On the ground floor are the fuse and relay and recording instrument boards. All circuit breakers, governors, rheostats and field switches are electrically con-

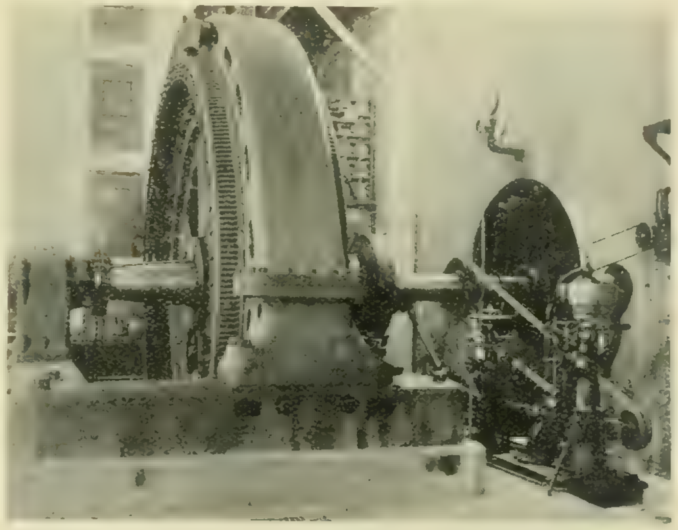


Fig. 4.—Single Unit and Governor, Point du Bois.

trolled and the wires run in conduits to a sand tray in the basement running the length of the building. From this sand tray. the control wires are carried to the fuse board and distributed from there to the relay and to the recording and control boards. The fuse board comprises eight standard switch board panels of black marine finished slate. The graphic recording meter board is back of the fuse board and comprises seven standard panels on which are the graphic recording ammeters, one for each generator, and for each transformer bank an integrating wattmeter. graphic recording wattmeter, volt meter and power factor meter. The relays are also mounted on this board. On the control gallery are the control pedestals, local service board, exciter board and the 120 amp. hour, 65 cell, storage battery. The control pedestals comprise two transformers and two generators at the present time with provision for a total of five each, the transformer pedestals, which also control the transmission lines, being arranged in a straight line along the front of the gallery and the generator pedestals and exciter instrument board forming a semi-circle at the back. Each transformer pedestal controls a bank of transformers and a transmission line and carries volt-meter, three line ammeters, three transformer-ammeters, which indicate current inside delta connection, one frequency meter, indicating wattmeter and power factor meter. Each generator pedestal controls three generators and has the following meters: an ammeter, indicating wattmeter and field ammeter for each generator; a volt meter and the three necessary control handles, for rheostat, governor and field switch. Test receptacles are provided so that any instrument may be checked up. The arrangement of control pedestals is clearly shown in one of the accompanying cuts. The exciter board consists of three panels of black marine finished slate and has beside the exciter control devices and instrument, an automatic synchronizer, synchroscope, and a Tirrill regulator. The local service board comprises five standard

panels of black marine finished slate and controls the battery, d.c. power, a.c. and d.c. lighting, and a.c. heating.

The exciter switchboard is located on the generating room floor directly in front of the exciters and comprises two panels on which are mounted the solenoid operated carbon break circuit breakers. The field excitation bus-bars are carried below the ceiling of the oil piping subway and run the length of the building.

Auxiliary Equipment.—For the station lighting and power there is provided a 300 kw., 6600—250/125 volt, three phase, air-cooled transformer. The a.c. lighting circuits

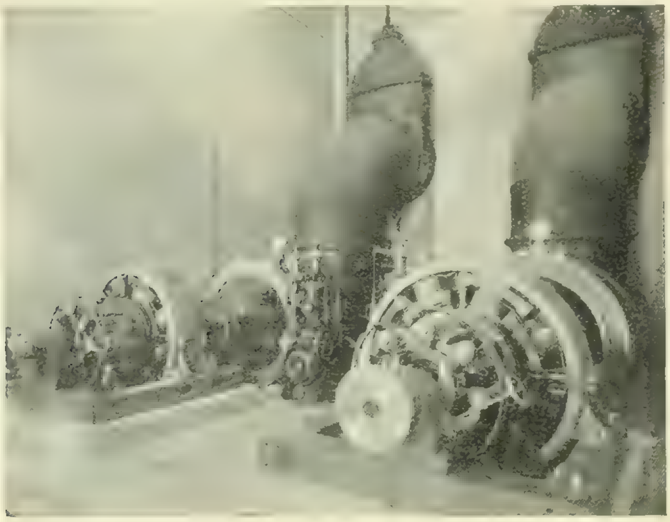


Fig. 5.—Two 250 K.W. Turbine-Driven Exciter Units.

are distributed to panel boards by three phase four wire circuits with connections to the switchboard so arranged that direct current may be thrown on these circuits in case of failure of alternating current. The building is electrically heated, the mains consisting of three 3-phase bus-bars in the basement. These are asbestos covered wire, one line being 500,000 c,m. and the other two No. 0000 B. and S. Risers are taken from bus-bars from conduit to each outlet, a no-arc cutout being provided on each riser. The heaters are 5 kw. 250 volt and of the latest type GE tubular units. There are a total of 63, 28 of these being placed under gratings in generator room floor. The others are portable and may be attached to plugs in various parts of the plant. The lubricating oil filter system is also electrically heated. A complete system of oil handling apparatus for drying and refilling transformer tanks is installed. the drying apparatus being Westinghouse de-hydrators. 100 watt tungsten lamps arranged in two, three and four light clusters are standard for the illumination.

In order to test the hydraulic efficiency of the water turbines, a special flume was built in the tail race of the spare units. This consists of two thin concrete walls extending out 55 feet from the buildings as shown in the cut of the plant. The floor of this flume is level throughout its length, giving a uniform cross-section to the discharge from the turbine under test. The velocity of the water in the flume is measured by a diaphragm suspended from a raft. This is released from a position near the power house when load conditions are right. and is carried down the flume by the current. Electrical contacts on the inside of the flume wall are closed when the raft passes, and they complete a circuit to the recording instrument, which indicates the time the raft and diaphragm passes these points, from which data the velocity of the water and, knowing the cross-section, the volume of water is computed.

Transmission Line.—The power transmission line is built over a 77-mile 100-ft. wide private right of way. The country traversed is greatly varied as to soil, there being rock, musgeg and ordinary farming land so that many problems had to be met in providing footings for the towers. There is at present erected one steel tower transmission line and a telephone line with provision for a future transmission line. The towers are of the two circuit type as shown in the accompanying cuts, each transmission line having wires spaced at 6 ft. centres. The wires are of 19 strand, 278,600 circular mils and each circuit has a capacity of 11,250 kw. The standard towers are spaced 1,200 feet apart, a flexible tower being placed midway between towers and acting as a strut. The standard towers are 50 feet high and the flexible 42 feet. These towers are riveted in the field and painted black. The longest span is 939 feet, across the Winnipeg river. The tower footings are of concrete in firm soil and in other places concrete on piling and in several locations a crib work has been built so that these particular towers are practically floating on the muskeg. Disconnecting switch towers are provided at two points on the line making sections of 23, 29 and 25 miles in length. At these disconnecting switch towers, lines may also be interchanged so that if both transmission lines are broken in different sections of the line, power still can be delivered through other sections. Standard 18-in. aluminum sleeves are used for splicing the wires. Each circuit is transposed 6 times between the power house and Winnipeg so that the wires enter the terminal station in same place relation that they leave Point du Bois. Locke four-shell insulators are used for the 66000 volt circuit. The shells are 16 in. in diameter with an overall height of 13½ inches. No. 2 B & S soft drawn wire is used to fasten the cables to the insulators, 42 servings being made so that cable is well protected from any arc at the insulator. The telephone line consists of a single metallic circuit of No. 12 gauge copper and is carried on glass insulators on a wooden pole and is transposed in a continuous spiral, four turns per mile. Telephone booths

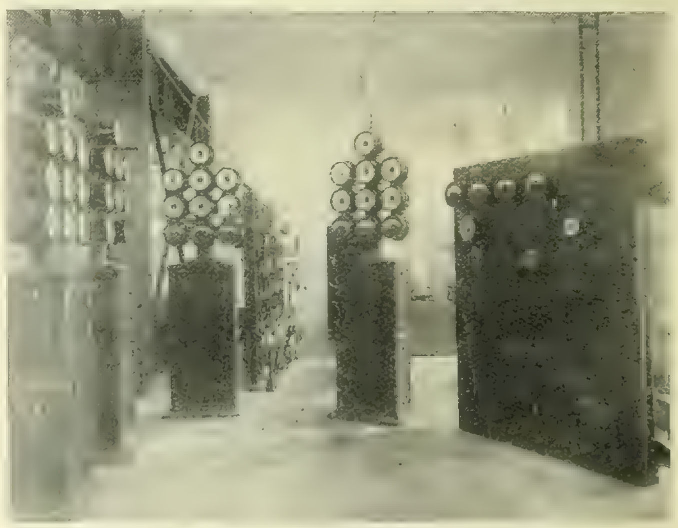


Fig. 6.—Control Pedestals and Exciter Instrument Board.

are provided at convenient points and at every mile an iron clad jack box is mounted on the pole. Ample provision is made for the care of patrolmen and 12-ft. patrol road is provided alongside the telephone line. About twenty miles of this road had to be laid of corduroy.

Terminal Station.—The terminal station is located on River street on the west shore of the Red River and occupies half of a city block. As at present erected, there is capacity for 24300 kw. of which 16200 kw. is installed. The building is a neat looking red brick structure with white stone trim and reinforced concrete foundation. A

spur track leads into the crane room onto which open the transformer compartments. A Niles electric crane is used for handling shipments and transformers. Each phase of the transmission line enters the building through a separate hood, the lightning arrester equipment being identical with that at the generating station and similarly installed in a separate fireproof compartment for each wire. The high tension circuit breakers are similar to those at Point du Bois and are mounted on the floor of a large high tension room, the disconnecting switches being fastened to a steel frame work suspended from the ceiling. ⅝-in. copper tubing is also used for high tension bus bar work. Cloke coils are provided on the incoming circuits and also on transformer circuits. These circuits are carried through insulator bushings to the high tension terminals of the transformers in the compartments below These transformers are very similar to those at Point du Bois, there being of course a different arrangement of compartments and structure for delta connections. The secondaries are designed for 13,200 volts and are carried between barriers under the floor of the low tension switch room to the transformer circuit breakers of which there is one type C 600 amp. 13200 volt for each of the two sets of bus bars.

The switch and bus bar compartments are of concrete

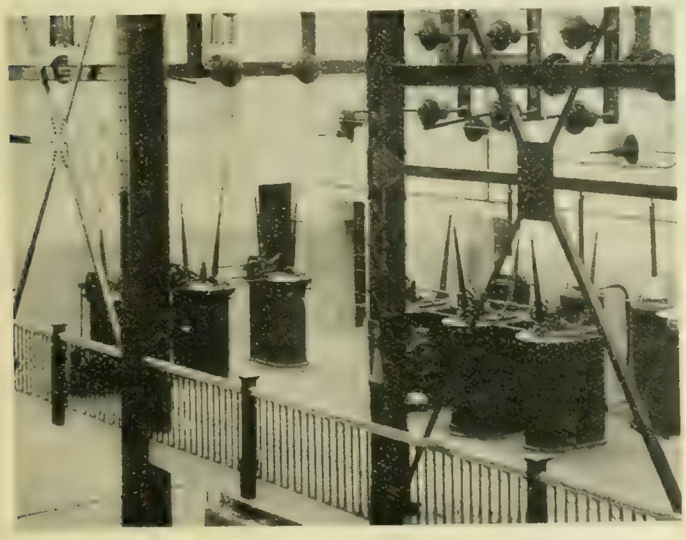


Fig. 7.—High Tension Switch Room, Winnipeg Municipal Plant.

and the two sets are identical in layout. The 13000 volt feeders are carried from circuit breakers into the basement where are located the pot-heads of the distributing cables. These cables are carried on a structure of steel and wood rack suspended from the basement ceiling. Static dischargers in the shape of low equivalent lightning arresters are provided for each underground cable. The two sets of bus bars are in turn subdivided by tie switches.

Control Equipment.—The arrangement of control and metering devices is somewhat different from those in the generating station, a bench board of black marine finished slate being provided for the control of the various circuits, a dummy bus-bar and indicating lamps showing clearly to the operator the condition of the various switches. Facing this control desk is an indicating instrument board. On this are 3 ammeters for each high tension line, 3 ammeters and one wattmeter for each transformer bank and an ammeter for each feeder of which there are ten in the present layout, two volt meters a frequency meter and provision for a synchroscope. This bench board is mounted on a gallery at the west end of the high tension switch room and at what will be the centre of the completed building. On this floor is also mounted the local service switch board for the control of the 300 kw. 3 phase, 13,200—250/125 volt Berry transformer and the various heating and lighting circuits and the storage battery. On the floor below is the standard four panel black marine slate fuse board to which come all the control and instrument transformer circuits. In the rear of this is mounted the four panel recording and relay board. On this board are the integrating wattmeters for each of the feeder circuits and for each trans-

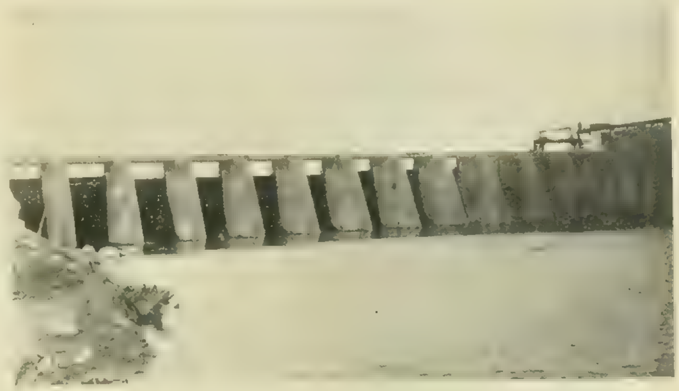


Fig. 8.—Control Gates Before Flooding Forebay.

former circuit an integrating wattmeter, a graphic recording wattmeter, power factor meter and volt meter. A selective system of relays is used for protecting transformers and high tension lines, the transformers being protected by overload and reverse current relays and the high tension lines by combination of selective watt and overload reverse current relays, these connections so arranged that in case one transmission line breaks down between power house and terminal station, both selective watt and reverse current relay for that line operate and trip the circuit breaker out. The overload relay on the other line will however fail to trip out its circuit breaker because the selective watt relay will only operate on reversal of power and both relays must operate in order to trip out the circuit. Straight series trip coils are used on the transformer circuit breakers. The control wiring is carried in conduits and sand tray similar to the method used at the generating station. Disconnecting switches on the negative side of the circuit breaker control circuits can be opened by workmen repairing these breakers so that operator cannot close same from switchboard. Another set of disconnecting switches

Fig. 9.—Generating Station, Discharge Side, Point du Bois.

operated by the circuit breakers throws the voltage transformers for either set of bus bars onto the feeder watt meters, so that only one set of voltage transformers is needed on each bus section.

Auxiliary Equipment.—The same comprehensive system of oil piping and drying that is used at Point du Bois

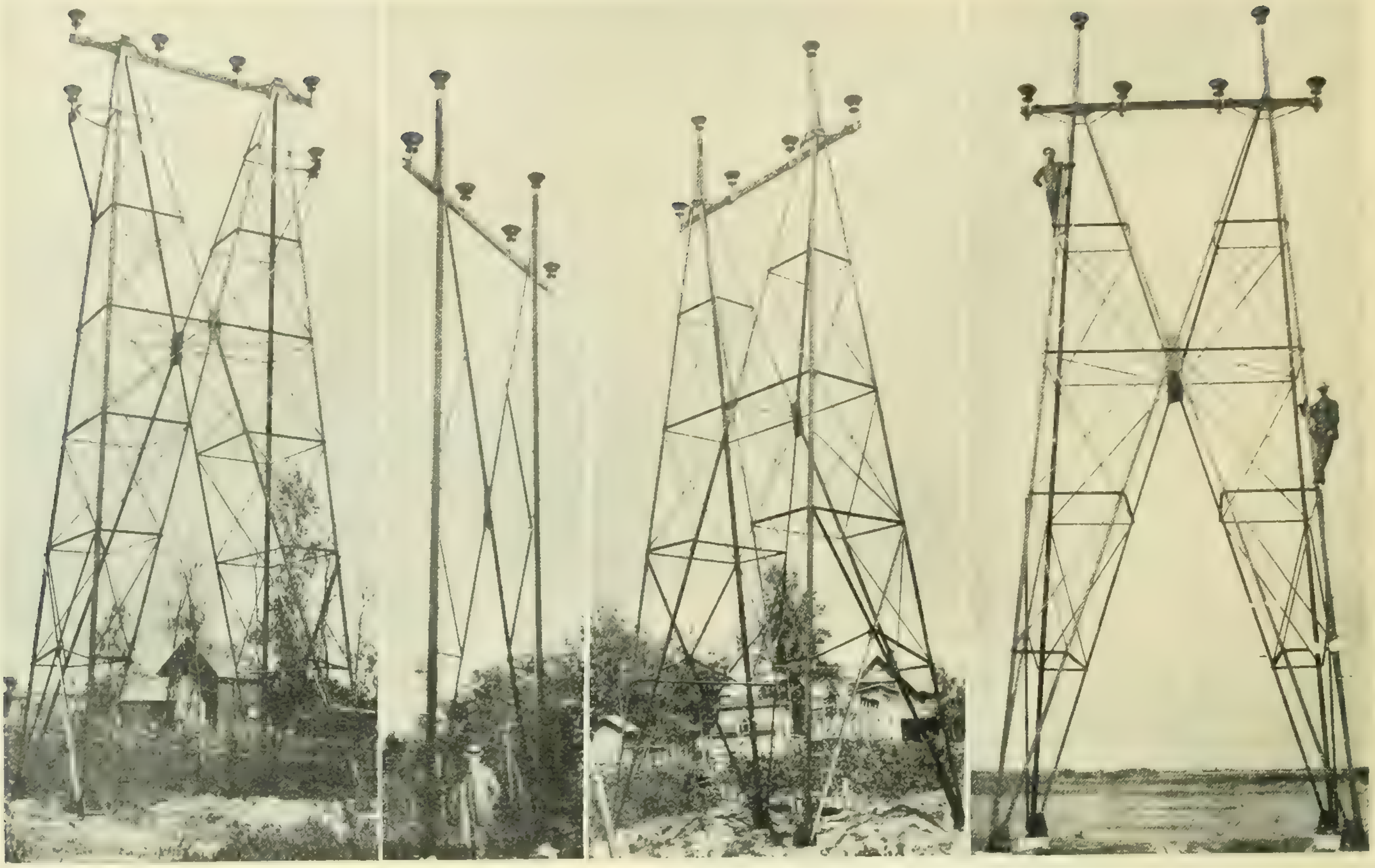


Fig. 10.—Typical Towers of Winnipeg Municipal Transmission Line. (1) Transportation. (2) Flexible. (3 and 4) Standard Braced.

is installed in the terminal station. In this case, however, oil is dumped into the sewer in an emergency. The cooling water for the transformers is carried to a wooden cooling tower from which it is sprayed and falls into a concrete tank from which it is pumped back into the transformer cooling coils. 5 kw. portable electric heaters are supplied for heating the building. A 200 kw. 200,000 volt testing transformer with regulating transformer for different voltages, a 200,000 volt electro-static volt meter, and oil testing cups and needle spark gap are provided for making high potential tests of oil and other materials.

Distribution System.—From the terminal station the current is distributed at 13,200 volts to three sub-stations located in different parts of the city, namely to Sub. No. 1 at King street; Sub. No. 2 at McPhillips street, and Sub. No. 3 at River street, the last named sub-station being temporarily located in the terminal station. From the above stations current is distributed as follows: In sub-station No. 1 there are six 500 kw. 13,200/2200 volt Crocker-Wheeler air-cooled oil-insulated transformers with necessary switching devices. It may be noted that a standard has been made of 500 kw. air-cooled transformers for distributing stations. There are also in this station two Siemens 500 kw. synchronous motor-generator sets, the generators being 550/275 volt, 3-wire direct current for distributing commercial power for elevators and other down town office uses. In sub-station No. 2 are installed six Westinghouse transformers of the standard as outlined above with necessary oil switches and 8-panel switch board; switches and low tension bus bars are mounted in a concrete structure. From this station there is, in addition to the [illegible] 2200 volt feeders, a 13000 volt line to the city's pumping plants located at the wells from four to seven miles out on the prairie. From this station will eventually be controlled all of the city's electrically operated pumps. excepting that at well No. 6. Sub-station No. 3 distributes 2200 volts 3 phase and single phase current. Sub-station No. 4 is used for street arc lighting only and is fed from the terminal station. It is equipped with both a.c. constant current transformers and mercury arc rectifier tubes of 4 and 6 amperes. This system will be changed later so that the lighting for different sections of the city will be controlled from the various sub-stations.

The standard voltage for overhead power all around the city is 550 volt, 3 phase, 60 cycles, but the corporation furnish also current of 220 and 440 volt, 3 phase, 60 cycles to large factories, etc., but same are from separate transformers. For the centre of the city where all circuits go underground, the standard pressure for power is 550—275 volts direct current. For light, the current is supplied with a pressure of 110 and 220 volt, 60 cycles, single phase, 2 and 3 wire all around the city from 2200 volt primaries.

All a.c. feeders both overhead and underground are so arranged that in case of trouble they can be switched over to any of the sub-stations through pole or manhole oil switches or disconnecting switches. A similar scheme is used for switching the underground d.c. feeders.

All underground cables are lead covered paper insulated, 3 conductors for 3 phase and single conductor for one phase and direct current except service cables which are rubber insulated lead covered. These cables run in standard 3½-in. round tile ducts with manholes and service holes of octagonal and square design. located at proper distances from each other. The ties between the feeders and service cables consist of specially designed manhole fuse boxes for 2 mains and 8 services each. The ground or neutral wire is not fed into the box and same consists of weatherproof single cover insulated wire or cable.

From all sub-stations the feeders run underground and turn up to poles located in some suitable place outside the station. This arrangement for connections between underground and overhead, consists of 2 poles located from

10 to 15 feet apart and connected to nearest manholes by galvanized iron pipes brought up to a platform between the poles. Cables end in a pot head screwed direct to the pipes, the leads from the pot heads run to an asbestos box through wall insulators and in this box is done all necessary switching, including switching for connecting the feeders to either of the above named sub-stations.

On all the main streets in the city will be erected a new system of street ornamental standards some for double and some for single arc lamps and on the same standards will also be mounted signals for fire alarms, police patrols and electrically lighted street name signs. The control for this signal service will all be arranged from Sub. No. 1 at King street.

The standard transformers for both overhead and underground are of single phase type and vary in size from 3 to 50 kw. The pole type transformers are supplied by the Canadian Westinghouse Co. and subway transformers, Canadian General Electric Co.

For the distribution in the city, the paper insulated lead covered cables are supplied by the Wire and Cable Co., and the rubber insulated lead covered cables by the Standard Underground Cable Co., Pittsburg, and are drawn in and jointed by the city employees. The weather proof wires and cables are supplied by the Wire and Cable Co., and the Eugene F. Phillips Electrical Works. The a.c. manhole fuse boxes are of the No-arc type, supplied by the Canadian H. W. Johns Manville Co., and the d.c. manhole fuse boxes by the Standard Underground and Cable Co.

The principal contracts for power plant equipment were let as follows:

General works at generating station, John Gunn & Sons, Winnipeg; turbines and governors, Jens Orten-Boving Co., London; alternators and exciters, Vickers Sons & Maxim, Sheffield, Eng.; transformers and switching equipment for generating, terminal and sub-station No. 2 and switching equipment for sub-station No. 1, Canadian Westinghouse Co.; auxiliary equipment, Point du Bois, Canadian

Fig. 11.—Terminal Station, Winnipeg Municipal Plant.

General Electric Co. and Canada Foundry Co.; auxiliary equipment terminal station, Chapman & Walker; steel towers, Manitoba Bridge & Iron Works, Winnipeg; aluminum cable, Northern Aluminum Co., Shawinigan, P. Q.; insulators, Locke Insulator Co., Victor, N. Y.; 12,000 volt cables, Canadian British Insulated Co., Montreal; construction of conduits, G. M. Gest, New York.

The design and construction of the entire system has been under the supervision of the firm of Smith, Kerry and Chace, with Mr. W. G. Chace in direct charge as resident engineer. The opening of the plant has been marked by the absence of the majority of the troubles that usually attend the initial operation of so large a layout, and much of the credit for this is due to the untiring efforts of Mr. Chace and his engineers as well as the excellent work of the different contractors. Messrs. Ruttan, Kennedy and

Fig. 12.—Underground to Overhead Arrangements.

Herdt have constituted the consulting board retained by the city.

The distribution system was laid out by Mr. James G. Rossman and his engineer, Mr. Theodore Malm and erected by Mr. J. C. Smith, as superintendent of construction. Mr. J. H. Sigfrid, is superintendent of the Point du Bois generating station.

A Meter on Every Car

The Tramway and Railway World. writing of the electric traction system at Wolverhampton, makes the following statement with reference to the use of meters on the cars:—

"There is also a considerable reduction this year in the consumption of electricity which is due to the fact that electric meters have been installed on all the cars. This has had the effect of reducing the current consumption by at least twenty per cent."

Rate Research Committee Report

The report of the Rate Research Committee of the National Electric Light Association of 1910 is now available. The published volume is being mailed to the members of the National Electric Light Association.

Mr. W. J. Doherty, Supply Sales Manager of the Northern Electric & Manufacturing Company, Limited, Montreal, has returned from a business trip to New York City and Hot Springs, Virginia.

The imports into Great Britain under the heading "Electrical goods and apparatus other than machinery and telegraph and telephone wire," for the first nine months of the present year only amounted to a shade over $1,000,000. This is even less than last year.

Montreal City and District

The Montreal Tramways Company

The affairs of the Montreal Street Railway Company have been largely to the front during the past month. Interest has centered in the proposal to reorganize the company by merging with the Park & Island Railway Company, the Montreal Terminal Railway Company, and the Public Service Corporation, under the name of the Montreal Tramways Company. Opposition to the proposal came from two quarters—the City and Senator Beique,—the latter on behalf of certain shareholders dissatisfied with the terms.

The opposition was voiced before the Public Utilities Commission, and was mainly, on behalf of the city, on the ground that the issue of new stock to the shareholders without placing any assets in the treasury would result in an enormous amount of inflated capital, which would tie the city's hands and prevent any future improvements of service or reduction in fares, as the earnings would be used in paying dividends on fictitious capital. The reply was a denial of any inflation, as it was only proposed to capitalize the company at its real value. To compel stock to be transferred to the new merger at par would be simply to legally rob investors of upwards of $150 per share.

The Commission, in its judgment, approved the merger. The commissioners discussed the financial aspect of the amalgamation, and came to the conclusion that the actual values of the stocks to be issued did not involve such fictitious creations of a nominal value as to be objectionable upon the grounds of public interest. On the general subject of dealing with such stocks the chairman said: "It has hitherto been assumed that fictitious or watered stock issues which have found their way into the hands of investors who have honestly paid good value therefor should be considered by public authority where the interests of such investors are concerned. Whatever may be the force and justice of this argument as applying to issues antedating the authority of this commission, we do not hold ourselves bound by any such consideration or practice in respect of any issues that may hereafter be made by public utilities whose rates or other matters fall within our control."

The chairman concluded by stating that the exercise of the commissioners' veto upon the proposed arrangement would be to seriously delay, and it might be for the time being jeopardize, a reorganization of the insufficient and variously constituted means of transport upon the island of Montreal and retard the advent of the service which the growth of population with increasing urgency demanded. They failed to see in the proposed arrangement such prejudice to public welfare as would justify them in rejecting it.

The question still remains as to whether the contract between the city and the company is perpetual, or whether the city has the right of expropriation at the end of thirty years. This point was brought before the commission, but the chairman replied that as it was a legal question the commissioners did not consider it necessary to express themselves.

Senator Beique, besides opposing the amalgamation before the commission, tried to get a legal injunction against the project but Mr. Justice Charbonneau dismissed the application.

Montreal Street Railway Annual Meeting

The annual report of the Montreal Street Railway Company for the fiscal year ended September 30, 1911, showed gross earnings of $4,775,300, net earnings $2,095,494. After all bond interest, taxes, city percentage, contingent account and so on has been deducted there is a net income remaining of $1,351,398. As the common capital is $10,000,000 paying 10 per cent., this takes a straight million leaving $351,398 to be transferred to the general surplus. This total net income amounts to 13½ per cent. on the common stock.

Mention is made in the general report of the organization of the Montreal Street Railway Company, and its controlled lines under the general management of The Montreal Tramways Company. Mention is also made of the negotiations which have taken place during the past year with the city of Montreal having in view the making of a new contract which would be applicable to present day conditions and which would admit of the extension of the franchise. The hope is expressed that the merging of these various companies will assist in a speedy completion of these negotiations.

Move to Make Commission Permanent

The Electrical Commission drawing up plans for the installation of wires underground has suggested to the council certain alterations in the law with the object of making the commission of a more permanent character. Under the charter, as soon as the commission has prepared plans for underground conduits and submitted the same to the Public Utilities Commission, whether these plans cover the whole or a very small portion of the city, the duties of the commission will cease. The commission believe that the only practical method is to prepare plans and specifications for a street or a section of the city, and submit them to the Public Utilities Commission, and, when approved, to hand them over to the city to proceed with the construction work. Thus the work of preparing plans and the construction can proceed simultaneously.

The Commission proposes to commence work by laying conduits in St. Catherine street, but Mr. Hibbard, chairman of the Public Utilities Commission is reported as saying that the plan of the work as a whole will have to be submitted to them before any particular section can be started.

The Status of the Board of Conciliation

Mr. Justice Charbonneau has issued a writ of prohibition against the Board of Conciliation, appointed by the late Government, to deal with a dispute between the M. S. R. company and home of its ex-employees. The company maintain that there was no ground for the appointment, as the alleged difficulty was covered by a clause dealing with railway disputes in the Conciliation and Labor Act. The company further attacked the constitutionality of the Industrial Disputes Act, contending it goes outside of the power conferred by the British North America Act. Following up this temporary injunction, the company has issued an application for a permanent prohibition and this will probably be argued in about a month's time.

Outremont Placing Wires Under Ground

The Town Council of Outremont, a suburb of Montreal, has adopted a plan prepared by Prof. Herdt for putting the electric wires underground. Tenders are to be called for the work so that a commencement can be made in the early spring. The adoption of this plan necessitates the reconstruction of the street lighting system, and the Montreal Light, Heat & Power Company has been requested to sub-

mit either a proposition for a new contract for street lighting, the company assuming the cost of the installation, or a proposition for a contract under which the company will supply the power in bulk for street lighting and the town assume the cost of installation.

Testing Car Fenders

Before the Public Utility Commissioners and their engineer, Mr. P. W. St. George, tests have been made on the Montreal Street Railway of four car fenders—the Conway, Moorhouse, Rose, and Bray; an unofficial test has also been made of the Hudson-Bowring wheel guard and fender, which is now fitted to the cars. The experiments were very severe, a special car being placed at the disposal of the inventors. Dummies made up to represent various types of men, women and children, were placed in positions on the line, and the car fitted with the fender was run at half speed and then at a speed of 16 miles an hour. In many instances the dummies, instead of being caught, were cut to pieces by the wheels. Mr. St. George will report to the commissioners.

Miscellaneous

The new stock of the Shawinigan Water & Power Company, issued at 108, was over-subscribed. There were many English applicants.

The power house of the North Hatley Electric Light Company, recently purchased by the Sherbrooke Railway & Power Company, has been burned to the ground.

Owing to increasing duties Mr. D. Lorne McGibbon has resigned from the Board of the Montreal Street Railway company, and is succeeded by Mr. J. N. McIntyre.

The Canadian Light & Power Company, Montreal, has signed contracts with the Saraguay Electric & Water Company and with the Canadian Car & Foundry Company to furnish them with power.

Mr. A. Gaboury, superintendent of the Montreal Street Railway, has been elected a member of the executive of the Transportation and Traffic Association of the American Electric Railway Association.

For the purpose of instruction, a wireless station has been erected in the College of the Immaculate Conception, Montreal. Many of the instruments were manufactured in the college. The installation has been tested and works admirably.

The Corporation of Windsor Mills, P. Q., has accepted the tender of The Canadian Crocker-Wheeler Company, Limited, of St. Catharines, Ont., for three-phase sixty-cycle apparatus, to replace the present equipment of 125-cycle single-phase. Mr. M. A. Sammett of Montreal is the consulting engineer.

Mr. James Bennett, electrical inspector of the Canadian Fire Underwriters' Association, Montreal, will represent his society at the convention of the Western Association of Electrical Inspectors to be held at Milwaukee on January 22 to 24. On the latter date the members of the convention will adjourn to Chicago for the purpose of seeing some practical demonstrations at the Underwriters' laboratories in that city.

In order to fill the vacancy caused by the resignation of Mr. Hugh A. Allan, who has taken up his residence in England, Mr. William McMaster has been appointed president of the Montreal Telegraph Company, Mr. William Wainwright succeeding Mr. McMaster as vice-president. Mr. Bartlett McLennan is the new director. For an unbroken stretch of nearly 60 years the president's chair was filled by three members of the Allan family.

The Robb Engineering Company, Limited, Amherst, N.S., have secured the following contracts: For the Welesley Hospital. Toronto, two Robb-Armstrong engines, direct-connected to Westinghouse generators, for their new power plant; for the Imperial Oil Company, of Winnipeg, a Robb-Armstrong engine of 150 h.p., direct-connected to a Westinghouse generator; for the Edison Electric Company, Springhill, N.S., a 200 h.p. Robb-Armstrong Corliss engine, direct-connected to an electric generator.

The Montreal Light, Heat and Power Company are holding informal dinners, which are largely attended by the staff. Afterwards there are talks on subjects of interest to the various departments. At the last dinner Mr. T. C. Martin, of New York, for 28 years the editor of the Electrical World, and now secretary of the National Electric Light Association, spoke on "Energy and Efficiency." The object of these gatherings is to get the men in closer touch with the officials and better acquainted with each other.

Mr. W. N. Dietrich, electrical and mechanical engineer, has the following work in hand, practically all of it in conduit: Birks Building, Montreal; Place Viger, Montreal, sheds, including fruit sheds, in-bound and out-bound freight sheds. Notre Dame street freight sheds, transfer platforms and mains; Tarte pier sheds; electrical work for the new factory of the Parmenter and Bullock Company, Gananoque, Ont.; Salada Tea Company's new factory and warehouse, St. Sulpice and St. Paul streets, Montreal; Imperial Oil Company's new warehouse, Montreal; Sir William Van Horne's extension to his residence, Montreal; C. P. R. Telegraph conduits, Place Viger, Montreal; houses for Scott & Harte, Westmount. Mr. Dietrich also carried out all the electrical illumination at the C. P. R. Station, Quebec, on the occasion of the Duke of Connaught's arrival.

Obituary

We regret to record the death, on October 21, by accidental shooting, of Mr. G. B. McNabb, business manager of the Montreal Light, Heat and Power Company. Mr. McNabb came to this position two years ago from Battle Creek, and had been very successful in working up the business department of his company. He will be remembered by the delegates at the last annual convention of the Canadian Electrical Association as the author of a very valuable paper on the subject of the Relations of Public Utility Corporations with the Public.

The Ontario Railway and Municipal Board

The application of the Town of Berlin, under 6 Edw. VII.. Chap. 34, Sec. 21, for approval of its By-law No. 1128, ($25,150 for Electric Light Extensions) has been considered and approved bp the Board, and Order issued confirming the By-law.

The application of the Hilton & Jocelyn Telephone Co. under 10 Edw. VII., Chap. 84, Sec. 9, for intercommunication arrangements with several other local telephone systems has been filed with the Board, and the Board has appointed Nov. 28th. at 2 p.m., at Richard's Landing, St. Joseph's Island, to hear all the parties interested.

The Nelson Telephone Company has filed an application against A. M. Shaver, under 10 Edw. VII., Chap. 84., Section 9, for intercommunication arrangements.

Trade Enquiry

1240. **Incandescent lamps.**—A London firm manufacturing metallic filament incandescent lamps desires to extend their business in Canada, and would like to hear from first-class houses in the Dominion willing to co-operate with them.

Electric Railway Progress

Quebec R., L., H. & P., Expanding

The annual meeting of the Quebec Railway, Light, Heat and Power Company, held recently showed that these merged interests are in a flourishing condition. The gross earnings for the year ending June 30th 1911 were $1,280,000 as compared with $1,128,000 the previous year. A noticably large saving was made in operating expenses so that the net earnings for the present year were $618,219 or an increase of about $135,000 over the year 1910.

Extensions have been made on a large scale. In the city division, while only about ¼ of a mile of track was added, extensive repairs and renewals were made and the roadway is now in excellent physical condition. 16 new cars of the modern p.a.y.e. type and 10 open standard-type cars were purchased and put in service during the year. In addition two large sweepers and 2 snow scrapers were added to the company's facilities for maintaining continuous service during the heaviest storms of winter. The car barns at St. Malo have been enlarged and provision made for still further extensions.

On the Montmorency division 3½ miles of double track have been added through a thickly settled district from Beauport to Kent House Park. Also about two miles of main line have been relaid with 80-lb. steel rails and additional tracks for yards and sidings to facilitate the handling of the increasing freight traffic have been put in. The main line has been rebonded during the year with type E. A. electric welded rail bonds. 48 gondola freight cars 60,000 lbs. capacity, 15 box freight cars 60,000 lbs. capacity and 2 passenger motor cars have been added to the equipment during the year and one electric locomotive has been constructed in the company's own shops. A new sub-station has been constructed at St. Anne de Beaupre and equipped with a 500 kw. motor generator set with the necessary exciter and transformers. A new transmission line has been built from Montmorency Falls to St. Anne de Beaupre and is now operating at 25,000 volts. The enlargement of the Kent House at Montmorency Falls Park, the amusement resort operated by this company, has already proven an attractive and profitable feature of the suburban business.

The recent extension known as the Quebec County Railway which was opened for operation about one year [illegible] warranted the expenditure incurred. The line has 2 1/3 miles of double track running from Maple avenue westward through Montcalmville to the top of Sillery Hill.

The consolidation of the various power supplies on the Queen street sub-station is being proceeded with. It is expected that this work will be completed shortly, when, in addition to enabling the company to utilize power from any one or all of its hydraulic stations, a large saving in labor and other charges will be effected.

During the year a contract was closed with the municipality of St. Anne de Beaupre for street lighting for a period of 10 years, as also a similar contract with the town of Levis. The contract with the Levis County Railway Company was also renewed for a similar period.

In addition to the railway, light and power departments handled by the Quebec Railway, Light, Heat and Power Company they also control the manufacture and distribution of gas. New installations for the year show 522 appliances of various kinds and 416 new meters. 18,644 feet of new gas mains were laid, so that the gas service now supplied to the citizens of Quebec compares favorably with that of the larger cities throughout the continent.

New Office Building of the Q. R., L., H. & P. Co., in course of construction

A fine new office building is in course of erection. The building is shown herewith and it is expected that it will be ready for occupancy very early in the new year. A large part of this building will be used for company offices but in addition there will be a large amount of space for rental and it is understood that many applications for offices have already been received.

The Quebec Consolidation is one of the companies in which Rodolphe Forget, M.P., is financially interested. He is also president of the company. Mr. C. E. A. Carr is general manager.

D. U. Makes Franchise Agreement with the City

An agreement has at last been reached between the Detroit United Electric Railway Co. and the city of Detroit, which will be submitted to the ratepayers for approval in the near future, and inasmuch as it has met the approval of the city authorities it has been taken for granted that the agreement will be ratified. The agreement provides that the city shall have the right to purchase the street railway system, or that part of it which is situated within the city limits, on six months notice. Failing this the franchise of all the various parts of the system shall expire in 1924. Purchase price to be decided by a committee of arbitration consisting of five persons.

In the matter of fares the council appears to have driven a hard bargain enough with the company. Tickets good from 5 a.m. to 8 p.m. are to be sold at 8 for 25c. and from 8 p.m. to 5 a.m. at 6 for 25c, with universal transfers in each case. Extensions to the amount of five per cent. of existing lines are to be made each year.

Rail-less Electric Traction

In recent issues we have referred briefly to two installations of railless electric cars that have been installed during the past year, in the cities of Bradford and Leeds, England. It appears that these installations were made after careful study of the situation at various points on the European Continent where similar installations have been in operation for some time. The choice of the two British cities would seem to have been justified as, according to all available reports, the cost of installation is reasonable, operating costs, even in sparcely settled districts, have in both cases been easily cared for by the ordinary revenue from fares alone, while the troubles in operating seem to have been much less than were originally expected.

The idea has taken such hold in England that during the past session of Parliament provisional orders were granted for the introduction of similar systems in Halifax, Brighton, Aberdare, Rotherham, Chiswick, and Northampton and it is said, further, that there are a large number of projected applications, for this system, to be made at the coming session.

The city of Edinburgh belongs to this latter number and proposes the installation of several miles of the rail-less system to supplement its present mileage in the rural districts. Edinburgh at present has 25 miles of tramway route and a population of 320,000; Bradford has 55 miles with 337,000 population; Leeds has 70 miles with 490,000 population. In view of the interest taken in Edinburgh in this matter a deputation was recently appointed to report on rail-less electric traction after visiting and observing the operation of the Leeds and Bradford systems. The deputation consisted of the city engineer and other equally capable citizens of Edinburgh and inasmuch as their report would be an unbiased expression of opinion on the two rail-less systems, as they saw it, a few extracts will be of value to our readers.

The Bradford System

In Bradford the length of rail-less line is a mile and a quarter which is travelled in about 8 minutes at a running speed of 9½ to 10 miles per hour. This short line forms the connecting link between two tramway lines which diverge from the central portion of the city. The maximum gradient was 1 in 15 but no difficulty was experienced either going up or down this gradient. It is the intention of the Bradford corporation to add 9 miles more of this line.

No expense whatever was incurred in the preparation of the roads. The road formation is in part paved with granite sets but for the most part is ordinary macadam. Careful inspection and close observation made by the deputation, showed no evidence of extraordinary wear upon this road due to the trolley cars.

The cars are operated each from 2 overhead wires with a double trolley pole, one leading the current down to the motors, the other returning the current back to the wire. The cars weigh from 3½ to 4 ton, are 21 feet in length, 7½ feet wide and seat 28 persons. Beneath the flooring of the car two 20 h.p. motors are installed attached by chain drives to the axle of the rear wheels.

The total cost of building this line was at the rate of $8,670 per mile including everything except the cars which cost $3,500 each. The current used in driving this car averages .95 of a unit per car mile, which is claimed to be about one-half that used by the heavier electric tramway car. The total cost per car mile including current, wages, tires, etc., is stated by the operating engineer to be 10.7c. per car mile, with a revenue of 13c. per car mile. The fare charged for the single journey of 1¼ miles is 2 cents.

The Leeds System

The construction and operation of the Leeds system corresponds with and bears out the facts given above in connection with the Bradford system. The cars are slightly different in their construction, the Leeds car being entered from the rear, whereas the Bradford cars open at the front with a view to having the motorman collect the fares and thus save the wages of a conductor. This plan, however, has not been found to work satisfactorily and at the present time on both systems a conductor is in charge. The actual cost of the Leeds system was $6,230 per mile and of the cars $3,500 each. The actual revenue per car mile is so far 17½c as against operating expenses of 11c., which it is thus anticipated will give a very satisfactory surplus.

A noticeable feature about this system was brought out by the manager, at Leeds, who explained that it was their intention to change this system over to the electric rail system as soon as increase in population and revenue would justify the additional expense, that is the rail-less system was considered only as a transitional stage in the acquisition of a properly equipped rail system. It was pointed out that if the overhead work was constructed according to the regular standard of electric rail lines, no change would be necessary except the removal of one of the overhead wires and the addition of the tracks below. In summing up their findings the committee say that this system offers the great inducement of being able to provide an excellent service at a minimum cost and that they have formed the opinion that this method of conveyance is capable of satisfying the requirements of many districts in and around Edinburgh, not already provided with public transit, in a practical and economical manner.

Single-Phase Operation in Snow Blockades

That the single-phase system is inherently fitted for electric railways is well illustrated by some experiences that the Spokane and Inland Railroad Company, which operates a 11,000-volt single-phase line (Westinghouse apparatus) in the State of Washington, has had during the last two years. It has been found that during the winter when the steam trains, operating on routes paralleling that of the single-phase, are unable to get through without considerable delay, single-phase trains hold very closely to their schedules. The principal reason for this is that on a single-phase road the voltage is so high that it holds up to almost normal even when the motors on the locomotives or cars are drawing very heavy currents. On an ordinary 600-volt road

when the cars must "buck" snow, the current consumption is so great that the line voltages usually drop to a value too low for effective operation. On a steam road the ability of a steam locomotive to haul loads is actually reduced in cold weather because of the greater losses of heat from the locomotive. The reverse is true with an electric locomotive because in cold weather the motors are maintained at a much lower temperature than in warm weather, hence their ratings are increased.

The winter of 1909 and 1910 was one of the most severe ever experienced in that vicinity. The Spokane and Inland was the only local road that maintained its regular scheduled service through this trying winter. At no time during the worst storms were the trains more than 20 minutes behind schedule time. This excellent showing was maintained even when there was a foot or more of snow on the ground and six to ten feet of it in cuts.

New Single-End Cars for Philadelphia

A new type of car was recently installed by the International Railway Company, of Buffalo, and also on October 15th by the Philadelphia Rapid Transit Company, of Philadelphia, New York. A single enclosed front platform is used for all regular entrance and exit, there being no exit door at the rear for ordinary traffic. There is, however, an emergency door at the rear end. This arrangement makes available, for seats, all the space formerly required for the rear platform, giving a seating capacity of 53, as compared with 40 in other cars of like dimensions.

The passengers entering at the front pass the conductor and deliver their fares before stepping into the body of the car. The front end of the car is provided with longitudinal seats which allow more space for passengers to enter and leave the car. In the rear transverse seats are used with a 31½-inch aisle.

Other features of these cars are a central ridge in the back of the seats which prevents two passengers in a seat from crowding each other; rounded seat at the back of the car; the placing of the lamps over the centre line of each row of seats; straps with sleeves of celluloid and very satisfactory ventilation. The Pennsylvania line has just placed 49 of these cars in operation.

The Chestermere-Calgary Suburban Railway Co.

The splendid city service supplied by the Calgary Municipal Street Railway system is to be supplemented in the near future by privately owned suburban lines. At the present time the Chestermere-Calgary Surburban Railway Co. are building 18 miles of track, and during 1912 expect to build 15 miles more. By the next year it is this company's hope to extend their railway to the Three Hills coal mine, a property situated 66 miles northeast of Calgary and 56 miles from Chestermere Lake. This company have large holdings in the coal property mentioned and also in the property bordering Chestermere Lake. It is the intention to install apparatus in the mine capable of producing 1,000 tons of coal per day, and it is also the intention to make Chestermere Lake an attractive summer resort.

The order for electric cars will go either to the Preston Car Company, or the Ottawa Car Company. These will not be p.a.y.e. type. The line will supply passenger service to Hubalta, Elderado, Forest Lawn, Victoria Square, Gladstone Heights, Birmingham, High-Gate and Belvedere districts, all of which the new road will pass through on the way to Chestermere.

It is said that Chestermere Lake promises to be a most attractive summer resort. The C. P. R. Co. have a town site at Chestermere Lake which will be put on the market next year, and even up to the present time various interests have disposed of about $200,000 worth of building lots at this point. The Chestermere Aquatic Club are building a $12,000 club house and another company have secured a site for the erection of a $50,000 hotel. It is expected that Chestermere Lake will soon become a popular suburban residental district for Calgary.

Installing Multiple Unit Control

As the interurban cars of the British Columbia Electric Railway Company are sent to the shops for repairs, alterations are being made to the equipment of each by the installation of the Westinghouse multiple unit control. This change is being made in anticipation of two car trains being operated next year between Vancouver and New Westminster when the cut-off just outside the latter city is ready for service, the grade at the entrance to the city being thereby reduced from 12 per cent. on one stretch to 2 per cent. The control being installed is of the type which automatically shuts off the power as soon as the motorman's hand is taken from the lever.

Two Dollars the Maximum

In a case brought in the Circuit Court, Montreal, to recover $50 damage from the Street Railway Company, the question was raised as to what amount a conductor is bound to give change for to a passenger. The plaintiff tendered a $5.00 bill which the conductor refused to change on the ground that he was not obliged to do so. There was no precedent case in Canadian jurisprudence, and counsel for the company quoted U. S. and French law on the subject. Judge Dorion, in giving judgment, while expressing reluctance to declare what was meant by a reasonable amount in French jurisprudence said that $5.00 was an unreasonable amount for a passenger to proffer for a 5c. fare. He then declared that according to strict law a conductor need not make change for even a ten cent piece, as it is presumed that passengers. on embarking on a car, know exactly what they have to pay for their fare and should have the necessary piece. However, according to law tempered by usage, $2.00 is regarded as a reasonable amount. The case of the plaintiff was dismissed with costs.

The Montreal and Southern Counties Railway Company proposes, should the city sanction the extension from the present terminus to the uptown shopping district, to carry on an express business, especially in the matter of garden produce.

Hydro-Electric Development in New Zealand

The New Zealand Government is undertaking the development of one of its most important waterpowers and to that end has appointed Mr. Evan Parry electrical engineer of the public works department. The first installation will be at Lake Coleridge and power will be conveyed to Christ Church, Lyttleton, and the surrounding districts. The electrical energy will be used for light and power purposes but it is also hoped to demonstrate the advantage of electricity for haulage purposes on railways generally. Enquiries are also being made with a view to establishing new electrochemical industries which would obtain their power from the government plant. The cost of the first installation is estimated at $250,000

Canadian Telephone News

Transmission Circuits for Train Despatching

By H. W. Fairlie

During the last few years the extension of the use of the telephone has gone hand in hand with the steadily increasing efficiency of transmission over long distances. Every issue of the different technical papers brings to light new instances where the telephone has found a new application due to its time-saving qualities, as well as its adaptability for universal use. It is only natural that in the face of these circumstances every effort should be made to increase the efficiency of satisfactory transmission.

Perhaps the two instances where this need has been the most imperative has been in the ever-increasing length of the long distance telephone lines, and in the second instance, the importance of the best possible transmission of telephone train dispatching circuits. In both cases the new methods have brought about the most exceptional results, and although the same scheme is not employed in each, still, both have been developed in view of the special conditions encountered.

Ten years ago Prof. Pupin, of Columbia, pointed out how telephonic current waves might be transmitted over in-

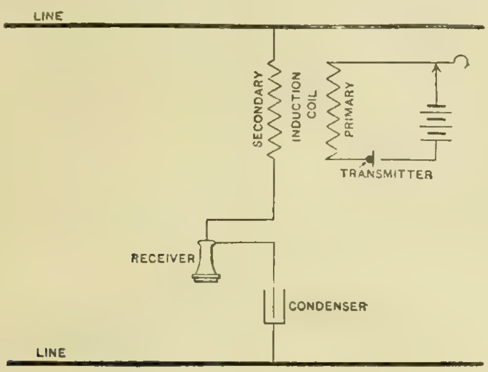


Fig. 1

creased distances without any great diminution of amplitude. The mutual capacity of the telephone circuit had always been the main cause of this trouble, and in cables especially, this was the more severe, due to the smaller distance separating the wires of a pair. It was suggested that coils possessing considerable self-inductance be inserted in the circuits as this would neutralize the effects of the mutual capacity. The theoretical mathematical investigation of these "loading coils," so named on account of the analogy of the mass of a vibrating cord to inductance of an electric current, was verified by considerable experiment.

As a result people are to-day able to talk from New York to Denver with a degree of satisfaction entirely impossible under other conditions. On lines suited to loading a 175-lb. copper open wire circuit is by this method made equivalent in transmission efficiency to a 435-lb. unloaded circuit.

With cables the relative gains are even greater, for a No. 19 B. & S. gauge cable, properly loaded, has a higher transmission than a No. 10 B. & S. gauge cable unloaded, although the latter is eight times the weight of the former. The Boston-Washington underground cables now being laid are the latest advance in this branch of the art.

With the circuits in use by the railroads, there is no necessity to secure transmission over lines more than a few hundred miles long, as this is the extreme length of division under one dispatcher. Here the gain has been made rather in the direction of superior apparatus than in a change in line conditions. The end in view was to make the receiving characteristics of the system at the dispatcher's end as superior as possible and at the same time provide an arrangement whereby a number of stations may all be listening on the line at once without any perceptible loss in transmission. With the introduction of selectors for signalling

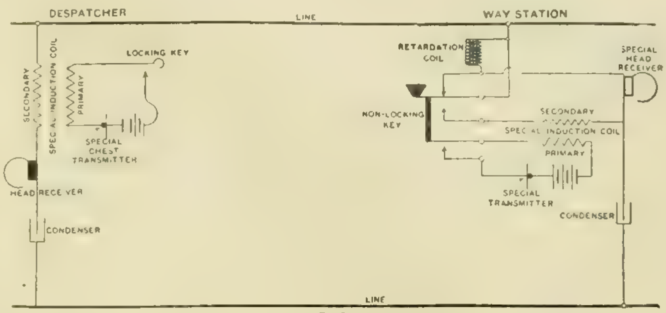


Fig. 2

purposes, this need became the more imperative on account of the additional permanent apparatus bridge across the line.

Fig. 1 shows the usual circuit of a local battery telephone. With the early systems both the dispatcher and the way station were equipped with this arrangement and with it condenser, receiver and induction coil secondary are in series during conversation with a low resistance receiver. About 300 ohms out of a total impedance of 600 was alone available for receiving. With a number of way-stations on the line at once the low impedance of the instruments in parallel made transmission difficult to distant stations.

This form of circuit was lately modified by using a larger induction coil with a hight impedance secondary and a low impedance primary. This scheme did not show as great a gain in receiving as in transmitting.

The latest development in the railway field for this class of service is shown in Fig. 2, and is the one in use by many of the roads in Canada and the United States. The dispatcher's equipment is similar to that shown in Fig. 1. A locking key is used by the dispatcher to open and close his battery circuit, although a foot switch, Fig. 3, may also be employed for this purpose. Special instruments of low impedance give the dispatcher improved receiving efficiency. A special breast transmitter and 70-ohm head receiver are the types in use.

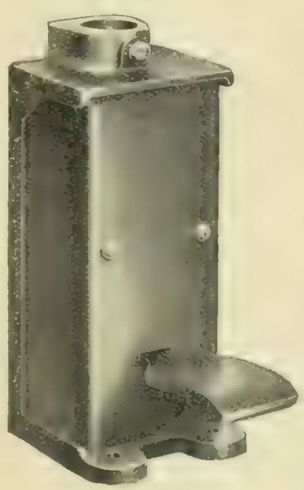


Fig. 3.

To meet the conditions previously outlined, a key or foot switch is used, as shown in Fig. 2. The listening position gives current through the receiver and condenser in series directly across the line and provides ideal receiving conditions.

With the key thrown to talking position, the receiver is in series with a retardation coil—normally short circuited—and both are in parallel with the secondary of the induction coil. These are bridged across the line through the condenser. This gives the best possible conditions for transmitting. The impedance of this bridge while receiving is 2,400 ohms to talking current, nearly all of which is available for receiving. The retardation coil cuts down excessive side tones in the receiver when talking, and

also by raising the impedance of the receiver current forces more of the transmitter current on the line. Should the dispatcher wish to break in on the operator, sufficient of his voice currents will pass through the operator's receiver and attract his attention. Here, too, special apparatus is used in induction coil, transmitter and high resistance receiver.

This arrangement is in use on circuits up to two hundred miles and over, with as many as forty-five stations; of this number twenty stations may be listening simultaneously without seriously impairing the transmission on the line. This system is in use by the C. P. R. and G. T. R., and in both instances were supplied by the Northern Electric and Manufacturing Company.

C. P. R. Telephone Train Despatching

"Train despatching by telephone" was the subject of an address by Mr. W. J. Camp, electrical engineer of the telegraph department of the C. P. R., at a noonday dinner of the members of the Electrical Association of the Province of Quebec, Montreal.

Mr. Camp devoted the first part of his speech to train despatching by telegraph, which, he said, was first done in the early autumn of 1851 on the Lake Erie Railroad. From this developed the system of despatching now in use throughout the American continent. The methods employed have been, during the last fifteen years, harmonized and brought into a uniform system which is used by all railways.

For a number of years the Association of Railway Telegraph Superintendents have been discussing the advisability of handling trains by telephone instead of by telegraph; as a matter of fact on almost every large road there have been occasions when the telephone was used in order to move trains on emergencies, although this was unauthorized. The first authorized application of the telephone for this purpose was made by the installation of a telephone despatching circuit on the New York Central and Hudson River in 1907, between Albany and Fonda, where there were four tracks controlled by block signals. This was followed by various circuits on double tracks, the primary cause of the installations being the passage of a law limiting the hours of telegraph operators to nine per day in stations where more than one operator was employed; on account of the scarcity of men following this law other means of operating had to be devised.

After the installation of these circuits, the greater facility with which trains could be despatched by telephone, as compared with telegraph, was immediately recognized, and various companies throughout the continent began fitting up trial installations. Among the earliest was the C. P. R., which now has nearly 4,000 miles of track controlled by telephone, the only road having a greater mileage being the Santa Fe. On January 1st of this year over 46,000 miles of line were equipped with telephone train-despatching circuits, and since then many thousands of miles have been added. The system is considered to be safer than by telegraph, as well as enabling despatchers to handle 50 per cent. more traffic. The indications are that within the next few years the great bulk of railways on this continent will employ the telephone system, although the cost of installation is six or seven times greater than that of the telegraph.

A few railways, including the C. P. R., equip with telephone apparatus all their trains in the sections where these circuits are installed. The crew is provided with a jointed pole, by which the telephone in the baggage car or caboose can be immediately connected with a telephone circuit in case the train should be stopped between the telephone stations. The conductor is thus placed in direct connection with the train despatcher and is able to report conditions and receive prompt assistance. As soon as the train is allowed to move, all that is necessary is to detach the jointed pole without in any way interfering with the regular telephone circuit.

Independent Telephone Convention

The annual convention of the Independent Telephone Association of Canada was held in Toronto on November 15. About fifty companies were represented. The most important item of business transacted consisted of a resolution with reference to Government ownership of long distance telephone lines, it being the general feeling of the one hundred delegates present that the Government should either undertake the purchase of or construction of long distance lines and that government ownership of long distance lines will be the only satisfactory solution of the present telephone situation.

The following officers were elected for the ensuing year: President, W. Doan, M.D., Harrietsville Telephone Association, Limited; Hon. vice-president, C. Skinner, Sherbrooke, Que.; vice-president, G. W. Jones, Port Hope Telephone Co., Ltd.; secretary-treasurer, Francis Dagger, Toronto. Executive committee: P. R. Craven, Temiskaming Telephone Co., Ltd.; A. Hoover, Markham & Pickering Telephone Co., Ltd.; S. L. Squire, Norfolk County Telephone Co., Ltd.; F. S. Scott, Brussells, Morris & Grey Municipal Telephone System; T. G. Ramshaw, Nelson Telephone Co., Ltd.; Geo. Taylor, Blenheim & South Kent Telephone Co., Ltd.; F. W. James, Welland County Telephone Co.. Ltd.; W. S. Ormiston, Uxbridge & Scott Telephone Co., Ltd.; M. A. Gee, Erie Telephone Co., Ltd.; H. Sneath, Burgessville Telephone Co., Ltd.; T. R. Mayberry, Ingersoll Telephone Co., Ltd. Auditors: E. E. Wilson, Consolidated Telephone Co., Ltd., Caledon; M. Banks, Niagara District Telephone Co., Ltd.

Manitoba Rates Go Up

Mr. F. C. Patterson, chairman of the Board of Telephone Commissioners for the province of Manitoba, has announced that the Government Telephone System will show a deficit of about $150,000 for the year of 1911. It is also stated this will mean a general raise in rates. It is claimed that the government will attempt to levy rates more in proportion with the amount of service a subscriber takes out of his telephone. This doubtless is the ideal way to pay for telephone calls just as one does for gas or electricity, but it is not yet made plain just how the Manitoba Government is going to work out its scheme.

Chilliwack Telephone Company Has Successful Year

At the annual meeting of the Chilliwack Telephone Co., the financial affairs of the company were shown to be in a flourishing condition. Much construction work has been done during the year, but, notwithstanding this, a dividend of 10 per cent. was declared, and $2,500 placed in the reserve fund. The officers re-elected for another year are as follows:—President, H. H. Gervan; vice-president, T. H. Jackson; directors, S. L. Hodges. A. L. Coote, G. H. W. Ashwell, H. Webb; secretary, W. L. Macken.

A Telephone With a Record

For some time efforts have been made to devise some appliance by means of which a permanent record of telephone conversations could be preserved. In this connection the phonograph has been most frequently thought of, and it

is now said that a success has been scored in this direction on the European continent. The receiving end comprises two loud speaking telephones, one of which is furnished with the usual mouth and ear piece, while the other is connected with the vibrating mechanism of a phonograph. The current required for this telephone is said to be a little greater than the ordinary.

Telephone Notes

The new Kitsilano exchange of the B. C. Telephone Company is being added to the existing local circuits some time during November.

The application of the city of Toronto for an order compelling the Bell Telephone Company to change the present rates to telephone subscribers on the Island to the rates in force in other parts of the city has been decided by the Dominion Railway Board against the city.

The Belgian telephone administration is said to be constructing a new telephone line between Belgium and London, England. This will give direct telephone connection between the cities of London, Berlin, Frankfort and Cologne. It is expected that a trial of the new line will be made next month.

It is reported that the British Columbia Telephone Company will lay a new sub-marine cable connecting Point Grey on the mainland and a point near Nanaimo on Vancouver Island, a distance of about 30 miles. This will be the second cable across the Gulf of Georgia connecting the island with the mainland.

A joint stock company with a capital of $50,000, under the name of the Pontiac Rural Telephone Company, Limited., has been formed at Shawville, P. Q. The company will take power to construct and operate lines and branch lines to Portage du Fort, Bryson, Calumet Island, Cambells Bay, Fort Coulonge, Chapeau, Otter Lake, Ladysmith, N. Bristol, N. Onslow, Quyon, Elmside, Bristol, and intermediate and local points.

The British Columbia Telephone Company are rushing work on the underground conduit system in Victoria city in agreement with the by-law passed last year authorizing the city's expenditure of $100,000 towards the expense of placing the telephone lines below the surface in the business section of the city. The construction of a new telephone exchange building in the city of Victoria is also well advanced. When completed this building will be one of the most modern of its kind on the continent.

Following on the filing of notice by the Bell Telephone Company that it will apply to the commission for an increase in rates in Toronto, on the ground that the present scale results in a loss to the company, the Telephone Committee of the Montreal City Council has altered the form of its application for a reduction of local rates. Originally it was asked that the same rates be ordered in Montreal as are now being paid in Toronto, but the new form of application is for an order requiring the company to substitute the following tariff for the one now in force: fifty dollars per annum for business telephones and $30 for residential telephones; the abolition of the present mileage rate of $5.00 per annum for each quarter of a mile or fraction thereof for instruments beyond six miles of the East End exchange, or one mile beyond the Westmount exchange. The commission is also asked to order that no payment be collected from persons using the pay-telephone unless they secure the desired connection with the persons called.

Questions and Answers

GENERAL RULES TO BE OBSERVED BY CORRESPONDENTS

1. All enquiries will be answered in the order received, unless special circumstances warrant other action.
2. Questions to be answered in any specified issue, should be in our hands by the close of the month preceding publication.
3. Questions should be confined to subjects of general interest. Those pertaining to the relative value of different makes of apparatus, or which for intelligent treatment, should be placed in the hands of a consulting engineer, cannot be considered in this department.
4. To avoid trouble and unnecessary delay, correspondents should state their questions clearly, so that there can be no possible doubt as to the information required.
5. In all cases the names of our correspondents will be treated confidentially.

Theory of Induction Motor

Q.—I am operating a number of induction motors and though I do not experience any trouble in their operation I cannot understand their construction, as I have never had any practical work in motor winding. Could you explain in a general way the construction of an induction motor and tell me something about the theory of its operation, but kindly do not make your explanation too technical.

A.—Neither the construction nor the theory of a simple induction motor should cause you any great difficulty. You understand that induction motors are built to operate on alternating current. 3-phase current is at present by far the most generally used, but it is possible that you would understand the construction of a 2-phase induction motor more easily, from which you could follow out for yourself the necessary changes for a 3-phase machine.

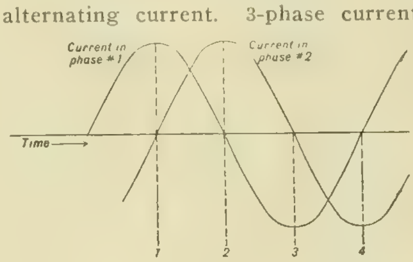


Fig. 1

You are probably conversant with the usual method of representing 2-phase current, equal load on each phase, by the accompanying diagram shown in Fig. 1. Here the phases follow one another at an angular distance of 90 degrees. Such current is usually carried by 4 wires, 2 wires to each phase.

Fig. 2 will explain diagrammatically how these four wires are connected through the motors. In this diagram the stator or stationary part has poles as indicated by the letters N S and O (O representing a neutral pole) on the different circles. Suppose circle No. 1 shows the polarity of the field at the start. Then circle No. 2 shows the polarity after the first quarter cycle; circle No. 3 shows the polarity at half cycle; circle No. 4 shows the polarity at three-quarter cycle; circle No. 5, which is identical with circle No. 1 shows the polarity after the passing of one complete cycle.

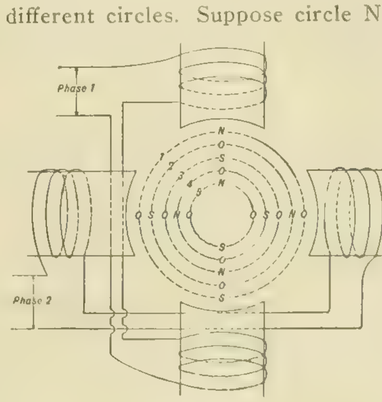


Fig. 2

It will thus be seen that the poles have made a complete revolution in the direction of the hands of a clock in exactly the same way

as if the two poles, energized by direct current, had actually been revolved.

The rotor of the induction motor consists of an iron core, generally laminated, mounted so as to turn between the poles of the stator as an ordinary armature does. Around the circumference of this rotor conductors are imbedded which may be interconnected in many different ways. In what is known as squirrel-cage winding these conductors are all short circuited on one another by being connected to conducting end rings. For larger motors the conductors are generally connected to slip rings supplied with brushes which are connected through a resistance.

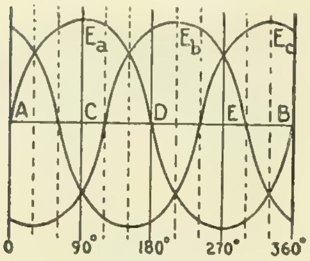


Fig. 3

You will now see why this type of apparatus is given the name "induction" motor because the coils wound on the rotor only carry current as it is "induced" by the magnets of the stator. Revolution of the rotor, therefore, simply follows the regular law that any conductor which carries an electric current is either attracted or repelled by a magnet (depending on the direction of the current). In this case it works out that the revolving motion of the field as described above, the direction of the induced e.m.f., and so on, act in such a way that the rotor revolves in the same direction as the magnetic field.

It will now be a comparatively easy matter to understand the construction of the 3-phase machine. The curves shown in Fig. 3 represent the form and phase relations of a 3-phase equally balanced circuit. Fig. 4 shows diagrammatically how these windings are arranged in a 3-phase induction motor. When the current in phase 1 is positive and maximum, A A form north poles and $A^1 A^1$ form south poles. After 1/6 of a cycle current in phase 2 becomes a maximum so that B B form north poles and $B^1 B^1$, south poles. After 2/6 of a cycle the current in phase 3 becomes a maximum and north poles are formed at C C, south poles at $C^1 C^1$. It will be seen that the poles revolve as with the 2-phase winding and we have what amounts to a rotating field which drags the rotor around after it in exactly the same way as in the 2-phase machine.

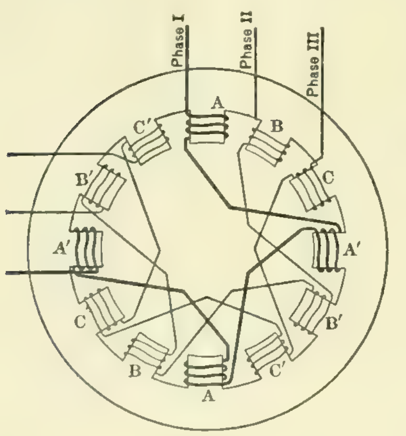


Fig. 4

Automobile Lighting

Q.—In your October number you published a short paragraph explaining how an automobile gasoline engine may be started automatically by a motor-generator which also supplied the lighting for the automobile. Will you explain something more in this connection about how automobiles are lighted.

A.—In general there are three systems from which one may choose, (1) a storage battery alone, (2) a magneto and storage battery, (3) a generator and storage battery. The first requires no explanation, the battery being used in the ordinary way and requiring a charge every so often from some outside source. In the second method a magneto, which is in reality a low voltage a.c. generator supplies current for lighting and also to the coil for ignition purposes. A storage battery is also necessary in this case to illuminate the car when it is standing still. An unsatisfactory factor in this system is that the current of the magneto cannot be utilized to charge the batteries, so that these must be charged also from some outside source.

The third method would appear to be by far the most satisfactory. The storage battery floats on the feed lines leading out from the generator. The generator supplies direct current for lighting and also charges the battery when the car is running at a high rate of speed or during such time as the lights are not required at all. When the car is standing and the generator stopped the latter is disconnected from the lighting circuit which is fed by the battery alone. It is a simple extension of this system which is being used to start the gasoline engines, the generators being run as motors by supplying them with current from the storage battery.

What is a Rotary Converter?

Q.—What is a rotary converter? Is it the same thing as a motor generator? Please give a short description of its general use.

A.—For the economical transmission of energy, as direct current, either close proximity of the generator to the point of power application, or the use of alternating current for transmission is necessary. For this reason direct current for railway service is seldom generated as such in this progressive age. The tendency is to generate all energy as alternating current in large economically located stations, and to transmit it as alternating current to substations, located in the section where it is utilized as direct current in the railway motors. Rotary converters because of their exceedingly high efficiency are peculiarly adapted for this work and are usually used in the sub-station for converting from alternating to direct current.

A motor-generator and a rotary converter perform the same function. A motor-generator means a motor and generator combined in one machine, with two separate pole windings and two separate windings on the armature. Sometimes only the armature windings are independent with a single pole winding; this would be a dynamotor. When there is just one field winding and also one armature winding provided on one end with collector rings for receiving alternating current and on the other end with a commutator and brushes for delivering direct current, this is called a rotary converter. In such a machine the armature revolves while the field and brushes remain stationary.

The combined efficiency of a rotary converter and its transformers is considerably higher than that of a motor generator set of equivalent capacity and voltage. This advantage in efficiency is even more marked at light loads than at full loads, and since the load factor of railway systems is usually low, the inherent fitness of the rotary converter is evident.

Multiple Unit Control

Q.—In your November issue you speak of a western railway system installing "Multiple Unit Control." Kindly explain what this means.

A.—Multiple unit control is a term applied to railway control equipments arranged for multiple operation of two or more cars from a single point. This arrangement enables a single motorman at the head of a train of any number of cars to operate the control circuits of each motor car, giving the same results as would be obtained if a motorman were located on each car, and all operating the controllers simultaneously. In addition to the advantages of reducing platform labor and increasing the hauling capacity of the road, this system of control removes all main circuit wires carrying heavy currents from the platform, thus elim-

inating the dangers of control blow-outs. The standard multiple unit switch control system includes a number of individual unit switches, which are pneumatically operated and controlled by means of small magnet valves admitting or releasing compressed air taken from the brake system to or from the switch cylinder. At an early date a detailed description of the system to which you refer will be published in the Electrical News.

Tungsten Lamps are Reliable

Q—When tungsten lamps were first placed on the market some time ago I procured a number for some of my customers, but on account of frequent breakages my customers have not seemed inclined, and I have not encouraged them, to use this type of lamp during the past year or two. What is the present state of the tungsten industry and do you consider them suitable for the ordinary central station to handle

A—Your experience was very probably similar to that of a number of other central stations in the early stages of the tungsten lamp, but the modern tungsten has almost outlived its reputation of unreliability. The writer knows of lamps that have been in constant use during the last 12 months that are apparently in as good condition to-day as when they were installed, and during that time they have received quite their share of blows and hard treatment. Much better records than this are reported too. If the tungsten lamp is properly installed and receives anything like decent treatment there does not seem to be the slightest reason why central stations should not handle them without loss. In spite of the fact that complaints have been heard that the reduced consumption of these lamps tends to cut down the revenue of the producer, it seems to be a fact that the popularity of the greater quantity of light produced by these lamps has more than offset any loss of revenue due to the extra efficiency of the lamp. Quite a number of low-voltage tungstens are now being installed, these being often connected in series to add up to the common 110 volts. The writer knows of one very successful installation where four 27½-volt tungsten lamps are connected in series on a 110-volt main. Two 55 to 57 volt lamps connected in this way are quite common. This type of lamp is probably no more fragile than the old carbon lamps.

Trade Publications

Storage Battery Cars,—Bulletin issued by the Gould Storage Battery Company, New York City.

Valve Gear,—Bulletin 36 issued by the Bates Machine Company, Joliet, Ill., descriptive of their new Inertia Valve Gear.

The Roof Everlasting.—A little booklet issued by the Canadian H. W. Johns-Manville Company, describing the J. M. Transite asbestos shingles.

Lanterns and Fittings, for street, shop, and works lighting. A bulletin issued by the Wardle Engineering Company, of Manchester, England.

Pass & Seymour,—Catalogue No. 19, issued by this Electrical Supply Company from their Solvay, New York office, descriptive of the P. & S. electrical specialties.

Portable Meters,—Circular 1104, issued by the detail and supply department of the Canadian Westinghouse Co., Hamilton, descriptive of portable meters for alternating and direct current.

Railway Equipment,—Folder 4184, issued by the Westinghouse Electric and Manufacturing Co., Pittsburg, descriptive of Westinghouse railway equipment; also folder 4186, on Westinghouse auxiliary contactor apparatus; also leaflet No. 2371 describing type Q, engine-driven direct-current interpole generators.

Canadian General Electric Co.,—Pamphlets on "Flush Plates," "Sign Receptacles" and Condulets. Also trade letters on "Friction and Splicing Tapes," and "Flush Wall Receptacle and Cord Connectors."

X Cell Batteries,—Catalogue, issued by the Canadian Carbon Company, Limited, from their new office, at 96 King street west, Toronto, describing their dry batteries, carbon products and general electrical supplies.

Modern Car Construction,—A pamphlet, issued by the Dahlstrom Metallic Door Company, Jamestown, N. Y., describing the Dahlstrom products and their application in the construction of fire-proof cars.

Brush Testing.—A little booklet being distributed by the National Carbon Company of Cleveland containing valuable information on the best methods of brush testing. The booklet also contains a description of the company's own methods of inspection and testing.

Automobile Lighting,—Bulletin 12A, issued by the engineering department of the National Electric Lamp Association, describing the electric lighting of automobiles. Also bulletin 8C, descriptive of miniature carbon lamps for decorative, automobile, telephone, or special service.

Escher Wyss & Co.,—A booklet issued from the Canadian office of Escher Wyss & Co., Toronto, descriptive of the works of this company at Zurich, Switzerland. The booklet contains chiefly, illustrations which show the construction of the various parts of these well-known turbines.

The Willcox Water Weigher,—Bulletin No. 9, issued by the Willcox Engineering Co., Saginaw, Mich., through their Canadian agent, J. J. Martindale, 112 Mail and Empire Building, Toronto; descriptive of the uses, construction and operation of this apparatus.

Benjamin Electric Mfg. Co., Toronto, has issued and distributed their new catalog C-20. This publication shows many new Benjamin devices and fixtures, and in addition, lists the well-known line of C-H Push Button Specialties, Federal Specialties and Wirt Insulating Joints.

Brimsdown,—A bulletin issued by the Brimsdown Lamp Works, England, describing and illustrating the manufacture of their metallic filament incandescent lamps, under the colloid-tungsten and improved patents. Price lists of this well-known lamp are also given.

Westinghouse Apparatus,—Descriptive leaflet 2373, issued by the Westinghouse Electric & Manufacturing Company, descriptive of their box-frame, interpole railway motor No. 303 A. Also leaflet No. 2374, descriptive of box-frame, interpole railway motor, No. 310 C.

The Emeralite.—A pamphlet issued by the Canadian General Electric Company, descriptive of the emeralite desk and piano lamps which are fitted with a green plate glass shade having a white opal glass reflecting surface inside. The same company is distributing a pamphlet describing the H. & T. automatic door switch; also series 2 No. 4 of "Condulet Talk."

Northern Electric Publications.—No. N1001, Magneto, Non-multiple Switchboards, with self-restored line signals. No. N1003, Magneto convertible, Non-multiple Switchboards with self-restored line signals. No. N1004, Central Battery, Non-multiple Switchboards with lamp signals. No. N1007, Accessories and protector equipment for non-multiple switchboards. No. N1008, Telephone Power Plant Equipments for non-multiple switchboards. No. N1116, Magneto, Telephone Sets and Accessories. No. N1117, Common Battery Telephone Sets, and Accessories.

Industrial Progress and Trade Notes

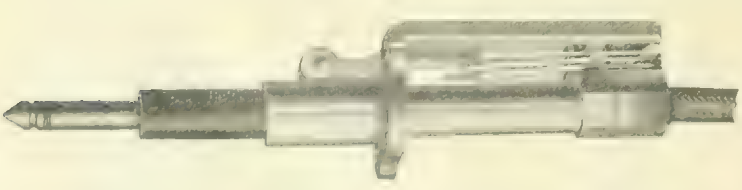
Manufacturing Electric Hammers

The Benjamin Electric Manufacturing Company has taken over the agency of the Electro-Magneto Tool Company, Chicago, Ill., and are manufacturing their well-known hammers in Toronto. These electric hammers offer the same possibilities of labor economy over hand work as air and steam hammers of corresponding capacities, showing a power economy of from 70 to 90 per cent. The cut shows

the Model No. 4 hammer, which weighs 25 lbs and is 13-in. long. In the construction of this hammer the height of simplicity has been obtained. A series motor furnishes the power. On the shaft of the motor is a small spur gear which meshes with a larger gear carried upon a jack-shaft extending through the motor frame. From a crank pin on the larger gear a connecting rod links the motor to the sleeve. Within the sleeve lies the hammer element, a piece of hardened tool steel. The connection between the hammer and the sleeve is magnetic, being furnished by a solenoid which lies around the sleeve and provides a cushion. The magnet in these tools has nothing to do with the delivery of the blow, acting merely as a flexible clutch to prevent the strain and jar of delivery from being felt upon the gears and motor. The current in the magnet coil is always in the same direction and remains unbroken while the tool is in operation. The tool delivers 1,800 blows per minute, the plunger having a stroke of about 1½ inches and weighing approximately one pound. It is impossible to force the tool, as the machine delivers a blow of uniform force whether running light or to its full capacity. The operation of the hammer is governed by a switch in the handle so that the pressure of the operator's hand closes the circuit which is instantly opened when the pressure is removed. It requires 220 watts to operate the hammer. The tools are built for either 110 or 220 volts direct current, and at either voltage may be operated directly from any direct current lighting outlet.

A New Plug Switch

Until recently practically all plug switches were operated automatically by the cord weight when the plug was in place. It has been found by long experience that plug switches constructed according to this general practice have

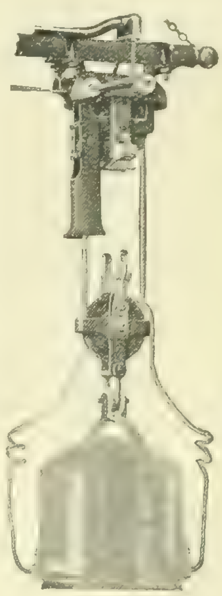


weak contacts, and require a considerable amount of spring adjustment and attention.

The Kellogg Switchboard & Supply Company have recently designed a new plug switch which differs very materially from the type previously used. When a plug is returned to its seat, it is necessary for the operator to force it in place in order to operate the plug switch springs. This method of operating makes it possible to use stiff springs, and hence, as platinum is used, the contact obtained is as reliable as that of a switchboard key. This plug switch is mounted in a vertical position, thus making it practically impossible for dust to collect on the contacts. As it occupies a very little space, almost as many plug switches with associated plugs can be mounted upon a plug shelf as is possible when plugs with ordinary plug seats are used. When a plug is forced into the plug switch, the sleeve of the plug makes contact with a metal roller, which in turn operates a small lever and closes or opens the plug switch contacts, depending upon the spring combination of the plug switch used.

Arc Light Hanger

A new type of arc light hanger, shown in the accompanying illustration, has recently been designed and put on the market by The Thompson Electric Company, 337 Superior avenue, N. W., Cleveland. In its construction is embodied an automatic cut-out device which makes its operation extremely simple. It may be used with a high degree of safety and has been approved by the safety appliance board of the United States Steel Corporation.



The Thompson hanger consists essentially of an upper and a lower member, each of which is provided with a pulley wheel, 4 inches in diameter, through which a lamp cord passes. These members may be disconnected by means of a short, light pull on the cord, and the lamp, accompanied by the lower member may be lowered to a point where it is accessible to the trimmer. On again raising the lamp, the two members of the hanger automatically re-engage on contact, and are held securely in this position by the weight of the lamp. As the electric current flows directly through the hanger the disengaging of the two members automatically shuts off the flow; hence the operator may trim the lamp without the use of the usual insulating stool.

Chapman & Walker Get Contracts

The Berg Machinery Company, Bathurst street, Toronto, are replacing their steam plant with electric drive. The new equipment will consist of twelve motors, totalling 127 h.p.

The Spectator Printing Company, of Hamilton, are installing individual motors on all their presses and machinery. The presses are to be driven by variable speed d.c. motors and current for same will be supplied by a d.c. generator, driven by an a.c. motor.

The University of Toronto are installing a 440 h.p., high speed, compound engine, driving a 300 kw., d.c., 3-wire generator.

Contracts for all the above equipments have been awarded to Chapman & Walker, Limited, contracting engineers, 69 Victoria street, Toronto.

Awarded the Grand Prix

We have been advised by Jones & Glassco, engineers, Montreal, that their principals, Messrs. Hans Renold, Ltd., of Manchester, England, manufacturers of steel driving chains, have been awarded the Grand Prix at Turin, Italy, for their chains in four classes, viz: Engineering, Cycle, Motor-Cycle and Motor Vehicle. This exhibition is considered one of the finest and most representative industrial exhibitions in Europe and the Grand Prix being the highest award is very much coveted.

The Ottawa Vacuum Cleaner

The Ottawa Vacuum Cleaner Manufacturing Company, Limited, has been formed for the purpose of manufacturing and marketing in Canada a high grade cleaner thus retaining much of the business which at the present time is carried on by importation. The name given to this cleaner is "Sunday," no doubt under the impression that in those houses where this vacuum cleaner is installed every day is like Sunday. The following data is of interest in connection with this machine: vacuum produced 10 to 11 inches on a mercury gauge; the displacement of air 33 cu. ft. per minute; cost of operation, 1½c. per hour; shape of machine, like a suit-case so that it may be easily carried; weight, 35 lbs.

New Motor-Driven Flasher

To meet a demand for something more flexible and of larger range than the so-called automatic flashers for signs having few lamps, for window decorations and displays of various descriptions, the Reynolds Electric Flasher Manufacturing Company have designed a new line of motor-driven flashers for various requirements, which are said to be sold at prices very little in advance of the cost of an ordinary fan motor, and yet are well constructed, compact and durable. The worm shaft runs on roller bearings and requires minimum power. Contact shoe and switches are made from heavy brass and copper heavily insulated from shaft, frame and gearing. Brushes are of the laminated type and are adjustable. Binding screws are conveniently located for easy and quick connections and have upturned lugs. The motors, notwithstanding the price, are high grade, being furnished by one of the largest motor manufacturers.

The flashers are made in capacities ranging from 5 to 12 amperes per switch and with any number of switches. The uses and applications of this line of flashers are varied; a sign may be flashed on an off as one; one side then the other; first border then reading matter; color combinations; spelling out a word letter after letter, and in many other ways. This flasher will also be found very desirable for glass and other transparent signs, window displays, etc.

A Canadian Electric Automobile

A new firm has been formed under the name of Peck Electric Limited, which will manufacture electric automobiles, in Toronto. The factory is located at the corner of Jarvis and Adelaide streets, where work is already well under way. The manager of the company is Mr. F. G. Peck who has had a long and successful experience in designing electric vehicles with some of the larger manufacturers in the United States. The new car will contain a number of new and clever features which speak well for its reception when it comes to be placed on the market, which will be about the beginning of the new year. Three types of machines will be manufactured, commercial, roadster and coupe.

In addition to electric automobiles this firm will make a specialty of isolated storage battery electric lighting plants of any capacity from 25 to 500 lights. They will also manufacture one or two small lines including switch boxes and spaces.

"Nine Lives" Spark Plugs

The accompanying illustration represents a spark plug being supplied by the Canadian Carbon Company, which is said to be up to the same standard as the other "nine lives" apparatus that this company has made famous. These are said to give equally good service on either high or low tension magneto, dry cells, switchboard. motor cycle, or gas and gasoline engines, or in fact anywhere that a spark plug is used. Every part of this plug is turned out on automatic screw machines, insuring uniformity and exactness. It is claimed that only the best material, the best porcelain and the highest grade of workmanship are put into these plugs. As a result the company guarantees them unreservedly.

Are Building Branch in Canada

The American Blower Company of Detroit, Michigan, with a factory also at Troy, New York, and branch offices throughout the world, have at last come to realize the importance of the Dominion of Canada, as evidenced by the application just filed for a charter for a company to be known as the Canadian Sirocco Company, Limited, of Windsor, Ontario. This company has acquired from the City of Windsor a tract of land, centrally located, comprising about four and one-half acres. situated on the Essex Terminal Railway, and will proceed at once with the erection of a plant which, it is claimed, when completed, will be one of the most complete of its kind on this continent. The company is proceeding at once with the construction of the erecting shop, 50 x 200 feet, to be of steel and concrete construction; also the office building. This is about all that it seems possible to complete for occupancy this winter. In all probability the foundry building will come next and will be started in the spring. This company will hold the exclusive patent rights for the manufacture in Canada of the famous "Sirocco" fans and blowers.

A Well-Insulated Head-Band

The Kellogg Switchboard & Supply Company report an increasing demand for their new enamel insulated head-band shown herewith. These head bands are thoroughly

insulated, enamel does not chip, of light weight and unconspicuous when worn. They are proving especially serviceable in railway dispatching work.

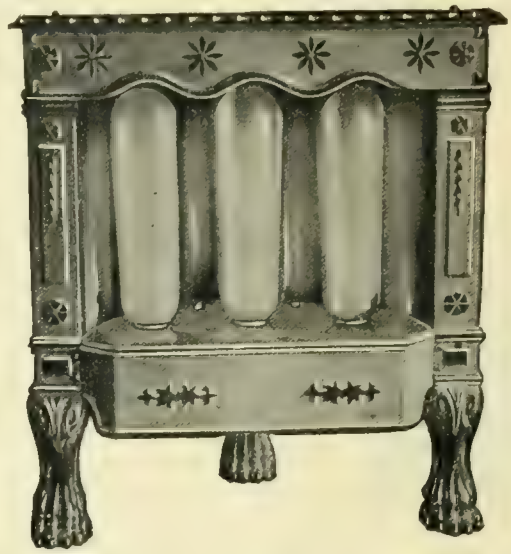
A Comfortable Idea

We illustrate herewith the exterior of the electrical display of Messrs. Chamberlain & Hookham, in the recent Olympia exhibit. Though the outward appearance is very attractive, indeed, it is understood that the interior was even more so to the average visitor. This interior comprised a number of rooms given up to the accommodation of friends

and enquirers, and included a sitting room with ample, easy chairs, a writing room where one may attend to his correspondence, and a refreshment room where light refreshments were available at all times. This type of exhibit is said to have succeeded in attracting the attention of the visitor much better than a mere display of apparatus would have done.

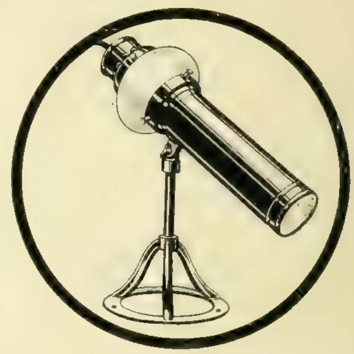
Electric Luminous Radiators

The illustration shown herewith represents the latest addition to the line of electrical apparatus manufactured by the National Electric Heating Company, Limited, of To-



ronto. The company claim that these electric luminous radiators are the first of the kind to be built complete in Canada.

The Electric Sign Projector



This is a simple device for projecting signs on the sidewalk or other prominent area where people are in the habit of casting their eyes. It consists of a powerful Nernst lamp in a 2⅝-inch tube containing also two projecting lenses and one focusing lens. The sign is contained on a stencil which is placed in front of the lamp as a slide is inserted in a projection lantern. Different signs may be used by having a number of stencils. The Westinghouse Nernst Lamp Co. handle them from their Toronto branch office, 78 Bay street. The cut shows a projector mounted on a stand which may also be used for attaching to the ceiling in a window or doorway.

Recent Engine Sales

Among the recent sales of engines reported by the Robb Engineering Company, Limited, Amherst, N. S., are, a 17 x 25 x 14 vertical compound for the Dominion Coal Company, Glace Bay, N. S.; a 23 x 30 type D. engine for the Richards Manufacturing Company, Campbellton, N. B.; a 13 x 14 D. C. engine to be installed at the Imperial Oil Company, Winnipeg, and a 12 x 12 engine to Frank Beal, Dorchester, N. B.

Single Phase Meters Approved

Mr. O. Higman, Chief Electrical Engineer of the Electrical Standards Laboratory, Inland Revenue Department, Ottawa, has advised the Canadian Electrical Association of the admission to verification in Canada of the type "C" single phase meter, made by the Ferranti Co., Hollinwood, Lancashire, England, and the A 1 single phase meter of Messrs. Chamberlain & Hookham, Birmingham, England.

Current News and Notes

Amherst, N. S.

A. V. Murray, electrician, has the contract for installing the new dynamo and switchboard in No. 1 factory of the Canadian Car & Foundry Company.

Berlin, Ont.

A proposition recently made by Mr. W. H. Breithaupt, president of the Berlin & Bridgeport Railway, to take over the management of the Berlin & Waterloo Railway System for a period of 5 years and to pay the city 25 per cent. of the gross receipts was not entertained by the town council.

Contracts in connection with the new street lighting here, including 10 Helios C.C. regulators, switchboard equipment for same, and 1,500 series fixtures complete with sockets and brackets have been awarded to the firm of A. H. W. Joyner, Toronto.

Brandon, Man.

A vote of the property owners on the question of whether Brandon should have a municipal or a privately owned street car system resulted in a large majority against municipal ownership.

Baden, Ont.

This village passed a by-law providing funds for power distribution. It was carried by a vote of 116 to 4.

Beachville, Ont.

The vote to spend $5.500 on hydro-electric equipment was carried by 84 to 5.

Bassano, Alta.

It is said that the contract has been awarded for the construction of 5 miles of electric railway connecting Bassano and the C. P. R. irrigation dam.

Calgary, Alta.

The total net surplus for the street railway for the month of October according to superintendent McCauley's report, amounts to $10,521. This is about double the profits of a year ago.

The motor generator set has been placed in operation and street cars are now being operated by power purchased from the Calgary Power Co. and generated at Kananaskis Falls.

This city will supply the power requirements of the C. P. R. at a rate of ¾c per kw.h.

During the present year 24 miles of street railway have been added. This brings the total for the city up to 40 miles.

The purchase has been recommended of much additional equipment in the way of street cars from both the Ottawa Car Co., and the Preston Car Co.

Mr. H. E. M. Kensit who was offered the position of superintendent of the city electric department declined the position.

Dutton, Ont.

At a recent general meeting of the ratepayers in Dutton a committee was appointed to interview the residents of Dunwich and Southwold in regard to the use of the hydro-electric power in their homes and on their farms. The committee has gone over the territory pretty fully and report that petitions for electric installations throughout the district have been very largely signed. The proposed route line will run from St. Thomas to Wallacetown.

Drummondville, Que.

New tenders will be called for a 250 h.p. turbine and a 150 kw. generator. W. A. Moisan. secretary-treasurer.

Edmonton, Alta.

The new 2,000 kw. generator is being installed with all haste. The wisdom of this piece of foresight is already evident as the town load is rapidly increasing and threatens to overload the present capacity of the plant before the new addition can be placed in operation.

Forest, Ont.

The council is considering the purchase of the electric light plant in the town. and it is likely that a by-law will be submitted to the electors regarding the matter.

Guelph, Ont.

The Goldie Flour mill in the city is now being operated entirely by Hydro-electric power. A 500 h.p. motor has been installed.

Work started on Nov. 9 on the street railway extension through St. Patrick's Ward.

Galt, Ont.

Tenders will be called for centrifugal pumps and motors to drive them.

The Galt, Preston and Hespeler Street Railway Co. have been granted the necessary privileges for a single line extension with necessary switches and turnout. The extension is intended to open up a new industrial sub-division beyond the waterworks.

The revenue from the distribution of electric light and power is so satisfactory that Reeve Scott, chairman of the Fire and Light committee, is reported to have promised a reduction in rates in the near future. Some dissatisfaction has been expressed in Galt over the method of payment adopted, which is based on the floor area of the residence as in many other cities served by the Hydro-electric Commission. In future a flat rate of 9c with a minimum charge of 90c per month will be given as an option.

Goderich, Ont.

Some time age Mr. L. P. Brodie representing English capital proposed the erection of a large salt manufacturing plant here. The erection of the plant was made contingent on the town of Goderich utilizing a certain amount of electric power which the company proposed to generate by using the exhaust steam from the salt works as the source of heat energy. At that time the proposition was turned down by the town as the rate $34.00 per h.p. did not compare favorably with a $25 rate promised by the Hon. Adam Beck if the government were allowed to work out the scheme. Mr. Brodie has now made a second offer to the town similar to the first, but reducing his $34 rate to $28.

Hamilton, Ont.

The council is discussing the question of increased street railway accommodation. It is claimed that lines could profitably be extended in almost every direction. It is suggested that the city petition the Ontario Railway and Municipal Board to compel the company to lay the necessary lines.

Tenders have been called for complete equipment for the distribution plant. Engineer E. I. Sifton.

It is said that Mr. John Patterson's plans for the construction of an electric railway line connecting Hamilton, Waterloo and Guelph, are nearing completion. The franchise was extended to Mr. Patterson only to the end of the present year, so that plans must be matured in the near future or the project dropped.

The city council has decided to enter into the usual co-operative contract with the Hydro-electric Power Commission and will take 2,000 h.p. immediately and another 1,000 during the next year.

Halifax, N. S.

It is said that the property of the Dartmouth Electric Light Co. has changed hands, the Royal Securities Co. having sold out to F. B. McCurdy & Co. for some party at present unknown, though the Nova Scotia Power Co. are mentioned as the purchasers.

Kenora, Ont.

A power line is being constructed from the town limit to the Scramble Mine. The mining company agrees to take 300 h.p. at $15 per h.p. By the end of the year this amount is to be increased to 1,000 h.p. when the price will be reduced to $10.

There is a considerable shortage of power at this point during the peak load hours owing to low water conditions in the river.

Kingston, Ont.

It is now suggested that power for this town will eventually be brought from Chats Falls which is only 100 miles distant as the crow flies.

The light, heat and power committee have recommended to the city council that a by-law be submitted at the January elections asking the opinion of the people on the question of obtaining a power supply from the Hydro-electric Commission.

The Grand Trunk Railway Co. will require 750 h.p. to run a drilling and crushing plant which will be installed in a granite quarry some two miles east of the city.

London, Ont.

The London and Lake Erie Railway Co. have appointed a committee to confer with the Hydro-electric Power Commission as to the rate at which they can obtain power sufficient to operate the line connecting London and Port Stanley.

It is said that plans are under preparation for the construction of an 80-ft. dam on the Aux Sables river for the generation of power for the London and South-western Radial Railway which it is proposed to construct between London and Sarnia.

It has been stated that the London Street Railway Co. who are in need of extra power will obtain this from the

plant of the Helena Costume Co. The city authorities deny that this company has the right to sell power under its present franchise.

The City Council has requested the London Street Railway to put on four new cars at once.

Lindsay, Ont.
A number of farmers in this neighborhood are anxious to secure electricity for lighting their homes and out buildings and operating machinery on the farm. It is understood that the Electrical Power Co. has been approached in this matter.

An agreement has been signed by Mayor Beal acting for the town, with the Light, Heat & Power Co. This agreement will represent a considerable reduction in rates in Lindsay and special consideration has been given the small householder. The Light, Heat & Power Co. is now one of the subsidiary companies of the Electric Power Company.

Lethbridge, Alta.
Superintendent Arthur Reid of the electric light and power department of this city, has been placed in charge of the work. of installing the municipal street railway system, in the capacity of supervising engineer. Superintendent Thomas H. McCauley, of Calgary has been appointed consulting engineer. He will visit Lethbridge from time to time and give the city the advantage of his successful experience in Calgary, Port Arthur and other towns.

The net profits of the electric light and power department for the last nine months amounts to about $11,000. Arthur Reid is superintendent of this department.

Moose Jaw, Sask.
Six cars are at present operating on the new street railway lines. and two more will be added in the near future. The question of Sunday cars is engaging the attention of the public at present.

Tenders were received up to November 13 for 20 non-interfering type, fire alarm boxes.

Montreal, Que.
The Superior Court has ordered the Montreal Street Railway Co. to extend its lines so as to give Emard ward a satisfactory service.

An Order in Council has been passed formally approving the plans of the Cedar Rapids Power Co. for the development of power at Cedar Rapids in the St. Lawrence river.

The plans for the underground system of wires being prepared by the Electrical Commission is making progress. It is said St. Catherine street will be the first to have its overhead wires removed.

Mimico, Ont.
This village has signed an agreement with the Hydro-electric Power Commission to take 50 h.p. at $31.50 per h.p.

Niagara Falls, Ont.
The Ontario Power Co. will extend their power house and add to their generating equipment.

North Bay, Ont.
This town is considering the question of securing power through the agency of the Hydro-electric Power Commission. The franchise of the local Electric Light Co., which is a subsidary of the Nipissing Power Co., has expired.

Nanaimo, B. C.
Negotiations are progressing between Mr. H. J. Haffner, of the B. C. Hydraulic Company and this city, for the construction of an electric railway system. Mr. Cecil B. Smith is said to be also interested in the construction end of the project.

North Toronto, Ont.
As the solicitors for the Toronto and York Radial Railway Co. have notified the North Toronto Council that the company would proceed to carry out the order of chairman Leitch, though this order is not supported by the other two members of the Board, it has been decided to appeal against the Board's order at once, in which case if the application is granted the work will be automatically stayed.

Ottawa, Ont.
The J. R. Booth Lumber Co. is said to have refused a $13,000,000 offer for their property. This offer included the water-power of the Chaudiers Falls.

The city of Ottawa has enlisted the support of the Ontario Hydro-electric Commission in its protest to the Government against the sale of a portion of Victoria Island, to Mr. D. O'Connor. Ottawa has designs on Chats Falls for municipal development and the sale of this island would render the purchase of the power plant more difficult.

Owen Sound, Ont.
Estimates have been prepared of the cost of constructing 6 miles of electric railway in the town of Owen Sound. It is not likely any further steps will be taken in the immediate future.

Penetang, Ont.
A by-law will be submitted asking authority to place the management of the waterworks and the electric lighting of the town under a Board of Commissioners to consist of two members ond the mayor. The commissioners are to be elected annually.

Port Credit, Ont.
This town will probably vote on the question of expending $10,000 on the installation of an electric light and power system, the power to be obtained from the sub-station which is located here.

Port Arthur, Ont.
Gross earnings for the month of September amounted to $17,660; net earnings $8,767. This is stated to be the best month the railway has ever experienced.

Pointe Claire, Que.
It is said this municipality intends to install waterworks and an electric light system.

Portage La Prairie, Man.
The City Council has passed a by-law fixing 15c per kw. h. as the rate for lighting. Meter rent costs 25 c a month and the minimum charge is $1.00 per month. Discounts of 5 per cent. below 50 and 10 per cent. above that amount are allowed. The rate for power will be 7½c per kw. h. with discounts as follows: 5 per. cent. on $5 to $10 account; 10 per cent. from $10 to $15; 15 per cent. from $15 to $20; 20 per cent. from $20 to $25; and so on to 45 per cent. for all over $50. 5 per cent. discount also allowed for prompt payment.

Quebec, Que.
The corporation of Quebec is calling for tenders, until Dec. 6, 1911, for the erection and maintenance of a system of street and other lights, including 250 arc lights, 226 incandescent lights, park lighting and the lighting of municipal buildings.

Regina, Sask.
The city council is considering the advisability of assuming control of all the spur track systems serving the warehouse district and operating the shunting by an electric locomotive as a municipal enterprise.

Rouleau, Sask.
The electric installation for the generation and distribution of light and power is nearly completed but it will be necessary for the town to spend an extra $15,000 to take care of unforseen expenses.

Rossland, B. C.
Some time ago the West Kootenay Power and Light Company of Bonnington Falls raised their rates for power and light to several mining and smelting companies at Rossland, Trail. Grand Forks, Greenwood and Phoenix. Application for redress was made by the mining companies to the British Columbia government who had an investigation of conditions made and reported on. The decision of the government has now been handed down that the company is well within its rights in increasing the rates. Mr. M. W. Doull, president of the Power and Light Co., states that it is not their intention to raise the rates at the present time owing to the prevailing unfavorable conditions in the copper market.

Renfrew, Ont.
Owing to limited amount of water power available for the municipal plant which supplies Renfrew the Hydro-electric Power Commission of Ontario is undertaking the construction of a storage dam at the outlet of Round Lake on lot No. 8, concession 13, township of Hagarty, county of Renfrew.

Selkirk, Man.
The Winnipeg Electric Railway Co. have completed the distribution system here. The town had been without light for some three months and when the city lights were turned on by the railway company early in November the satisfaction of the citizens was complete.

Sturgeon Falls.
The council is taking steps to submit a by-law authorizing the expropriation of the property of the Sturgeon Falls Electric Light and Power Company.

Shelburne, Ont.
James Pickering of this place has issued a writ asking for the appointment of a receiver for the Dufferin Light & Power Co., of which he is a bond holder.

Saskatoon, Sask.
Mr. H. M. E. Evans, of Edmonton, acting for the company which holds a franchise to construct and operate a street ry. system in Saskatoon states that active construction work will not be commenced before next spring. Work on the power house, which will be situated some 15 miles down the river, will

probably start about the same time. It is not expected that the hydro-electric power will be ready as soon as the railway and provision has been made for obtaining power from the city steam plant for a short time.

The Saskatoon Milling Co., which at the present time is obtaining power from the city's power plant will install a power plant of their own in the near future.

The Saskatchewan Power Co. is asking amendments to its act of incorporation, one of which amounts to a delay of a year in the completion of its water plant on the south Saskatchewan river which brings this date to December 31, 1914.

St. John. N. B.
The Inglewood Pulp & Paper Co., of Musquash, N.B., have advised the city council of St. John that it is the intention of the company to develop their power at Musquash for light, heat and power purposes. They ask that the city will not give rights which it is not prepared to give their company. It has 4,000 h.p. and is prepared to consider an offer from city to buy out its rights.

The New Brunswick Hydro-electric Co. are seeking admission to the city of St. John and have offered rates which represent substantial reductions on the present rates paid here.

St. Marys, Ont.
By-law was carried to raise $15,000 for electric power distribution.

Strathcona, Alta.
A special committee has been appointed to enquire into the matter of improved lighting throughout the city. A condenser will be purchased in connection with the present engines at an estimated cost of $5,000. The generator to be installed will probably be in operation towards the end of November. Mr. J. T. Watson is power house superintendent.

Sudbury, Ont.
It is said a franchise has been granted to Louis Laforest for operation of an electric railway to run to Copper Cliff.

Two 250 h.p. boilers will be installed in the present electric plant.

Southampton, Ont.
An electric pump for the waterworks will be required shortly.

Toronto, Ont.
The Ontario Railway and Municipal Board concedes the right of the Toronto and York Radial Railway Company to deviate its line from Yonge street along a private right-of-way running from Farnham avenue to the C. P. R. tracks, but has expressed the opinion that the street-crossings must be either by tunnel or viaduct.

Continued on page 80

Condensed Department

RATE

Positions Wanted, Positions Vacant, Miscellaneous. — 2 cents a word and 25 cents for a heading, per insertion.

Tender advertisements, equipment for sale, etc., 15 cents per agate line (14 agate lines make one inch) per insertion.

Advertisers who wish to conceal their identity may do so by using an Electrical News box number without extra charge.

Forms close on the 18th of each month.

SALES ENGINEER

A Large Electrical Manufacturing Company wishes to employ two young men in the Sales Department, College training and shop experience required. Must be of good address and good habits. Replying giving full information to Box 376, Electrical News, Toronto, Ont.

Generator for Sale

Warren, 45 kw., 41 amp., 1100 volt, sixty cycle, nine hundred revolution generator, used three months; guaranteed condition. A snap. Address, Box 352, Electrical News, Toronto, Ont.

Flame Lamps for Sale

For Sale—About 25, 60 cycle, 110 volt flame lamps, complete with individual transformer. First class condition. Allgemeine-Gesellschaft type. Changing to 25 cycles. Excellent bargain if sold in one lot. A. H. W. Joyner, 76 Bay Street, Toronto, Ont. 12-12

Swedish Electrical Engineers Wanted

For the technical staff of some of our foreign representatives we require as soon as possible a number of trained engineers. Please apply to us stating conditions, experience and references. Applicants should be unmarried and not more than 30 years of age. Applicants should possess:

A thorough theoretical and practical knowledge of electrical machinery and apparatus and their erection.

and should have been engaged in the business at least 5 years, should speak at least two foreign languages fluently and have had some business training in the country for which he desires employment.

Applicants must agree to a 3 to 6 months apprenticeship course at our works before being sent out to respective countries. This is a good opening for the right men.

Allmanna Svenska Elektriska Aktiebolaget,
Foreign Department
12-1 Vasteras, Sweden.

Proposals Wanted

Sealed proposals will be asked for during the next two months by the Hamilton Hydro-electric Department for bids on the following classes of materials required in the construction of a distribution plant for Hydro-electric power, throughout the City of Hamilton:—

A.—Substation buildings, heating, lighting, plumbing, etc., for same.

B.—Station equipment, including transformers, switches, switchboards, lightning arresters, instruments, oil tanks and other appurtenances.

C.—Wood poles, cross arms, pins, sideblocks, braces, insulators, machine bolts, lag screws, brackets, anchors, pole steps, guy wires, etc.

D.—Reinforced concrete poles, condulets, conduit, steel reinforcing, cross arms and castings.

E.—Underground conduit system construction, including cable racks, manhole and hand hole castings, structural steel, fuse pillars and castings.

F.—Conduit ducts (Tile, fibre or other system for underground distribution).

G.—Weatherproof and rubber covered copper and aluminum solid and stranded wire, lead encased cables and installation of same, distribution boxes, pot heads and connectors.

H.—Line transformers, meters, cutouts and devices, lamps, wiring supplies or other appliance, device, apparatus or material entering into the construction and equipment as above mentioned.

I.—Printing, stationery, office systems, and books of account and record.

Companies, firms or individuals desiring to tender on any of the foregoing equipment must file application for specifications with the undersigned engineer, stating specifically the portions and sections they desire to tender on and for sections A. B. and E. must deposit with the engineer a marked cheque payable to the City of Hamilton Hydro-electric Department for the sum of $10, which will be returned in the event of receipt by the Corporation of bona fide tender on the work specified accompanied by the complete plans and specifications with tender.

The lowest or any tender not necessarily accepted.

GEO. H. LEES, Mayor,

E. I. SIFTON, Consulting Engineer,
City Hall, Hamilton

Situations Wanted

WANTED—Position as manager of a combination electric and steam heating plant or either one separate. Have had ten years' experience in all branches of the business. Am 30 years old. Employed at present, but wish to go to Canada. Box 351, Electrical News, Toronto, Ont. 12-12

Positions Wanted

WANTED—Position or partnership in electrical or machinery business, by technical graduate, ten years' technical and commercial experience. Box 364, Electrical News, Toronto, Ont. 12-12

Positions Vacant

Salesman wanted. We want a live man to sell standard electrical books and other technical works. A fine income can be made. D. T. McAinsh & Co., 123 Bay Street, Toronto. 12-12

WANTED. First class electrical estimator for all classes of electrical work. W. M. Dietrich, 16 Sacrament Street, Montreal.